THE

DISEASES OF THE EAR,

THEIR

DIAGNOSIS AND TREATMENT.

A TEXT-BOOK OF AURAL SURGERY

IN THE FORM OF ACADEMICAL LECTURES.

BY

DR. ANTON VON TRÖLTSCH,

Aural Surgeon and Lecturer in the University, in Würzburg, Bavaria.

TRANSLATED FROM THE GERMAN AND EDITED BY

D. B. ST. JOHN ROOSA, M.D.,

ASSISTANT SURGEON TO THE NEW YORK EYE INFIRMARY.

Illustrated with Wood Engravings.

From the Second and last German Edition.

NEW YORK:
WILLIAM WOOD & COMPANY,
61 WALKER STREET.
1864.

R. CRAIGHEAD,
PRINTER, STEREOTYPER, AND ELECTROTYPER,
Carton Building,
81, 83, *and* 85 *Centre Street.*

THIS TRANSLATION

Is Respectfully Dedicated to

ALFRED C. POST, M.D.,

PROFESSOR OF SURGERY IN THE UNIVERSITY OF THE CITY OF NEW YORK, CONSULTING SURGEON TO THE NEW YORK AND ST. LUKE'S HOSPITALS,

Who, besides his useful labors in the field of General Medicine, has accomplished much for Aural Surgery, and to whose qualities as a teacher, surgeon, and a man this grateful testimony is borne by his obliged friend and former

PUPIL.

TRANSLATOR'S PREFACE.

THE work of presenting to the American Medical public a new book on the Diseases of the Ear, was undertaken, because it was believed that there existed a need for it.

The most prominent of the Text-Books, which have obtained a circulation in the United States, are those of KRAMER, of Berlin, ITARD and MENIERE, of Paris, TOYNBEE and WILDE, respectively of London and Dublin. The works of the latter named, and especially that of Wilde, have found the most favor.

Wilde's book has been out of print for some time, and there is no immediate prospect of a new edition. This is to be regretted, for probably no book has done so much for the advancement of its object as this production of a distinguished aural and ophthalmic surgeon.

Toynbee has achieved so much for the only basis of all scientific and real progress in aural surgery, pathological anatomy, that we can but be grateful to him, although his book, rich in materials, seems to lack many of the requirements of a text-book for the general practitioner.

Kramer's work was translated years ago, and we are indebted to it as being one of the successful pioneers in the way, now comparatively well trodden. Since then the author's views have been very much modified, and the last edition, "*Die Ohrenheilkunde der Gegenwart, Berlin*, 1862," lately translated under the auspices of the New Sydenham Society, would hardly be recognized as a lineal descendant of the first. This testifies at once to the honesty of, and progress in, the author's opinions.

Through the extreme courtesy of Dr. Kramer, while in Berlin, I had the opportunity of seeing a good deal of his large private practice, and the pleasure of hearing his peculiar views at some length.

I also saw somewhat of the practice of Dr. Erhard, Aural Surgeon and Lecturer in the University of Berlin, author of "*Klinische Otiatrie, Berlin*, 1863." This is not the place to enter into

any discussion as to the views of these authors, as compared with those of Von Tröltsch, whose book I am now presenting. The fact of the labor I have been at, shows sufficiently my belief in the scientific character of the book, and of its adaptability to the wants of our profession.

This work, if indeed the rendering into English shall not have proved a failure, will tell its own story, and will stand or fall by its own claims. Some few additions made by the translator will be found inclosed in parentheses.

I believe aural surgery to be a comparatively neglected field, and my own experience has already been ample enough to show that a very much larger number of very chronic cases come to the surgeon's eye than in other branches of our art; consequently, we cannot expect the same therapeutic results, as for instance, in Ophthalmology, and our reward for labor cannot just now be the dazzling one that falls to the lot of successful practitioners in other departments; but if we but succeed in waking up the profession to the curability of recent ear cases, and to the fallacy of the idea of *outgrowing* these affections, perhaps our work will be done. "Arbores seret diligens agricola, quarum adspiciet baccam ipse nunquam."

Without any responsibility for the truth of Dr. Von Tröltsch's opinions, his work is presented as one founded on pathological investigation, and ample experience, and as containing some views, which, *so far as I know*—and I hope reviewers will note this expression—are not to be found in any other book. His method of illuminating the external ear, is, I believe, altogether the best in use, and one which must commend itself to every one who has found the difficulties of the previously known methods. The lecture on "Purulent Catarrh of the Middle Ear, as occurring in Infants," is one that calls attention in a striking way to some loose habits of diagnosis.

I shall be personally indebted to any gentleman, who has opportunities for post-mortem examination of the infant subject, for the results of any researches in this direction. I am committed irrevocably to no opinions in the practice of aural surgery, except that much may be done to advance its position, and from the opportunities afforded in the bi-weekly clinic in the Eye Infirmary in this city, now conducted by Dr. Hinton and myself, but which was founded by Dr. C. R. Agnew, and successively sustained by his colleagues, Drs. Bumstead, Hinton, and Noyes, I hope to be able to add a testimony of some value for or against doctrines, which are now presented to the profession in these United States.

I have in this place to express my obligations to the rare scholarship of Mr. Alfred A. Post, and to my friend Doctor Henry D. Noyes, for some aid in correcting the proofs, and valuable suggestions of a general character.

D. B. St. John Roosa.

New York, February, 1864.

AUTHOR'S PREFACE.

In undertaking to lay before my professional friends a brief text-book, whose aim is to comprise the whole field of Aural surgery, and be at the same time the result of my personal observations and investigations, I scarcely need to apologize for so doing, inasmuch as this field occupies a peculiar position in science, and original works on the Diseases of the Ear, which are at once purely practical and strictly scientific, are still very rare.

Since it has seemed to me, that a certain brevity, and an emphatic presentation of what has been already settled and verified in distinction from questions still pending, would materially enhance the value of a text-book for the practitioner, I have clothed this work in an outward form suited to secure this end.

This will account for the fact, that the work has been divided into academical lectures. By this means I have been enabled to cut short historical considerations of the subject in hand, with also any critical estimate of what has been already accomplished in this department, and this much better than would have been possible in an ordinary text-book. For the latter circumstance, especially, I think I deserve the thanks of my readers.

I have, moreover, omitted all lengthy explanations, since they have been already stated in my "*Angewandte Anatomie des Ohres, Würzburg*, 1861," *Practical Anatomy of the Ear*, to which work I beg to refer my readers in all questions of an anatomical nature.

A few simple facts, it is true, have been unavoidably repeated, since otherwise the clearness of my reasoning would have been lessened. I trust, that I may not be found fault with for having occasionally quoted, even *verbatim*, some of my former monographs on sundry topics, as, for example, one on the examination and affections of the external ear, the use of the Eustachian catheter, perforation of the mastoid process, etc.

One of our shrewdest men, the æsthetic Vischer, has remarked

that the road to knowledge must always be travelled with resignation. This resignation comprises two things, viz. *first*, patience during slow progress in work, and unrestricted severity of method; and, *second*, the temporary renunciation of the whole of truth. It is only by being content to work out and investigate some points in the circumference, that we can be enabled to look into the centre, and by continually advancing from many points at last to penetrate to it.

The deep wisdom of these remarks is perhaps nowhere illustrated with greater force than in explorations into the field of natural science, where a genuine enthusiasm for the study itself will more frequently find expression in such arduous labors, as are, par excellence, the prerogative of the doggedly persistent German mind than is allowed in a work of this kind.

But, if there is anywhere need of such slow, resigned, methodical study, in which we penetrate with constant self-criticism, from the circumference towards the centre, it is in aural surgery, in the construction of which a solid foundation is yet to be laid, and for which fit material is yet to be procured. Here, each new, well chiselled, solid stone is of great and enduring worth, for, from these is to be obtained an increasingly stable foundation for a structure which shall gradually grow inhabitable.

It is certainly easier and quicker to rear a wooden structure, which with its gorgeous adorning may dazzle the eye, and whose color and ornaments may for a time beguile the ignorant into the belief that it is of stone, but time continually exercises a just criticism, and ere long such a worthless structure will be exposed to every gaze, in its real hollowness, while it falls emptily to pieces.

If I have anywhere formed wrong conceptions of facts, or explained them incorrectly, I shall be thankful for the information, and will gladly avail myself of any better knowledge.

I may express the hope that I may constantly obtain new fellow laborers in aural surgery, which is an equally grateful field in a practical and scientific point of view, and that I may have contributed towards obtaining for this speciality the esteem which is its due.

ANTON VON TRÖLTSCH.

WÜRZBURG May, 1862.

CONTENTS.

LECTURE VI.

DIFFUSE INFLAMMATION OF THE AUDITORY CANAL, OR OTITIS EXTERNA.

LECTURE VII.

OTITIS EXTERNA (CONTINUED). NARROWING OF THE AUDITORY CANAL.

LECTURE VIII.

INFLAMMATION AND INJURIES OF THE MEMBRANA TYMPANI.

LECTURE IX.

THE APPLICATION OF THE CATHETER TO THE EUSTACHIAN TUBE.

LECTURE X.

THE USE OF THE EUSTACHIAN CATHETER AS A MEANS OF DIAGNOSIS AND CURE.

LECTURE XI.

SIMPLE ACUTE AURAL CATARRH.

LECTURE XII.

SIMPLE CHRONIC AURAL CATARRH.

LECTURE XIII.

SIMPLE CHRONIC CATARRH (CONTINUED).

LECTURE XIV.

CHRONIC CATARRH OF THE PHARYNX, AS ACCOMPANYING CHRONIC AURAL CATARRH.

LECTURE XV.

SIMPLE CHRONIC CATARRH OF THE EAR (CONTINUED).

LECTURE XVI.

TREATMENT OF CHRONIC CATARRH.

LECTURE XVII.

ACUTE OTITIS INTERNA, OR ACUTE PURULENT CATARRH.

LECTURE XVIII.

PURULENT CATARRH IN CHILDREN.

LECTURE XIX.

CHRONIC PURULENT AURAL CATARRH, OR CHRONIC OTITIS INTERNA.

LECTURE XX.

AURAL POLYPI; A FULL CONSIDERATION OF THE IMPORTANCE OF DISCHARGES FROM THE EAR.

LECTURE XXI.

FURTHER CONSEQUENCES OF OTORRHŒA; PROGNOSIS AND TREATMENT.

LECTURE XXII.

NERVOUS DEAFNESS.

LECTURE XXIII.

LECTURE XXIV.

METHOD OF EXAMINING THE AMOUNT OF HEARING.

LECTURE XXV.

TINNITUS AURIUM.

DISEASES OF THE EAR.

LECTURE I.

INTRODUCTORY.

The Extraordinary Frequency of Diseases of the Ear—Their Great Importance as affecting the Individual, in his Position in Life, his Longevity, and Intellectual Development—The Great Prejudice against the Aural Practice—What must happen before Progress is made—Plan of this Work.

Gentlemen—At the time when you expressed the wish that I would give a series of lectures on Diseases of the Ear, you desired that I should not omit even the most insignificant details of this branch of science, assigning as a reason, that before this you had had no opportunity at all, except the most superficial, to see or learn what may happen to the ear. This ought to surprise me somewhat, when I consider that a number of you have passed the State examination, and as young Doctors will soon begin the practical course, while the remainder are at least in your last session. Moreover, you have pursued your studies not only in Würzburg, but also in other of the most renowned of our medical schools. Yet I know too well from my own experience, how true this may be. During the time of my student life (1847–1856), there was, in the schools of Germany and Austria, which I attended, and these were all the most celebrated, absolutely nothing to see in this province. I also visited, mainly out of great interest in this branch of science, the medical schools of Great Britain and France. I found, however, nowhere the opportunity of a thorough theoretical and practical study of diseases of the ear, although in certain

LECTURE XX.

AURAL POLYPI; A FULL CONSIDERATION OF THE IMPORTANCE OF DISCHARGES FROM THE EAR.

LECTURE XXI.

FURTHER CONSEQUENCES OF OTORRHŒA; PROGNOSIS AND TREATMENT.

LECTURE XXII.

NERVOUS DEAFNESS.

LECTURE XXIII.

LECTURE XXIV.

METHOD OF EXAMINING THE AMOUNT OF HEARING.

LECTURE XXV.

TINNITUS AURIUM.

DISEASES OF THE EAR.

LECTURE I.

INTRODUCTORY.

The Extraordinary Frequency of Diseases of the Ear—Their Great Importance as affecting the Individual, in his Position in Life, his Longevity, and Intellectual Development—The Great Prejudice against the Aural Practice—What must happen before Progress is made—Plan of this Work.

Gentlemen—At the time when you expressed the wish that I would give a series of lectures on Diseases of the Ear, you desired that I should not omit even the most insignificant details of this branch of science, assigning as a reason, that before this you had had no opportunity at all, except the most superficial, to see or learn what may happen to the ear. This ought to surprise me somewhat, when I consider that a number of you have passed the State examination, and as young Doctors will soon begin the practical course, while the remainder are at least in your last session. Moreover, you have pursued your studies not only in Würzburg, but also in other of the most renowned of our medical schools. Yet I know too well from my own experience, how true this may be. During the time of my student life (1847–1856), there was, in the schools of Germany and Austria, which I attended, and these were all the most celebrated, absolutely nothing to see in this province. I also visited, mainly out of great interest in this branch of science, the medical schools of Great Britain and France. I found, however, nowhere the opportunity of a thorough theoretical and practical study of diseases of the ear, although in certain

places, for instance, at Wilde's in Dublin, and Toynbee's in London, the opportunity was given for some valuable observations and to collect many details of practice of the highest value. This absence of opportunity for learning, in one entire division of medical knowledge, has something uncommonly startling, and recalls the fact right lustily to our consciousness, that there are few men who, only in a moderate degree, pay any attention to diseases of the ear. While the number of Oculists in Germany already begins to be Legion, and we have at least one in every school of high grade, and in every city not too small, the number of Aurists, who devote themselves to the subject in any particular manner, worth naming, in a literary or practical way, is still extraordinarily small. Whence comes this remarkable and wrong condition of things? Whence comes it that so few take any interest in this department? Whence is it, in fine, that the interest in these affections is so circumscribed, and the consequent sum of the knowledge of diseases of the ear, when we consider how the science of healing, on the whole, is advanced, is so little. We cannot get out of the way of this question. It occurs to every one, even in the most superficial consideration of the subject, and I shall deem it my duty to talk with you, concerning this query. In this manner I think we shall be able to come to our opposite standpoint of observation, and perhaps I may be able to tell the origin of many errors and prejudices, what their course is, and so expose them, that you shall not be deceived by them. Wherein, then, does it lie, that there is so little interest in this direction of our field of knowledge? "It is not worth the trouble, to give one's self up to the investigation of ear diseases," says one, "because there are so few cases." This now is a great error, a prodigious error; there are wonderfully many ear patients, yea even, when we examine the matter closely, there are more ear than eye patients. We remember that nearly all old persons, over fifty or sixty years, no longer hear perfectly well, many of them badly, a fact to which we have become so accustomed that in social life we scarcely notice it, being almost inclined to believe these symptoms to be physiological. We should also remember that in childhood discharges from the ear are by no means seldom, and that earache is so common with children that the greater

number of them suffer from it. But diseases of the ear occur very often in middle life. There are, it is true, very few completely deaf persons in this time of life, yet the number of those whose hearing power stands somewhat under normal is very considerable, and a greater number of persons in this period, in exacter observation, notice a diminution of the hearing if only on one side. But look only in our own circles, and see how few can only auscultate with one ear, "from habit" as they themselves perhaps think; in truth, perhaps, because they only hear distinctly with one ear. In ordinary life the demands made upon our hearing power are so moderate and undefined, that the departure from good hearing power must be quite considerable, if one's enjoyment for social life be disturbed. A great number of persons are hard of hearing on one side only, and their affection is not only unknown to their associates, but also to themselves.

Although it is hard to get at the exact state of the case, yet I think I shall say too little, rather than too much, when I consider that even in the middle period of life (20–40), of three persons, certainly one no longer hears well and normally with one ear at least. You will experience it in your own practice. In the beginning you will hear nothing of ear patients, until the people find out by some lucky chance that an aurist lives among them. Then suddenly a mass of ear patients will come to view, partly in persons whom you have already known, without any idea that you would be called upon to treat them with ear affections. We can generally see the complaint of eye patients. Ear diseases, however, are different, there is nothing striking in their complaint; and with or without the intention of the patient, it is commonly concealed. Believe me, there is an immense number of ear patients, and there would be still more of them known, if there were more surgeons who would take the care of them; for up to this day, many of the cases in the beginning are not observed, yes even, intentionally neglected and concealed. It cannot then, gentlemen, be ascribed to the absence of material, that physicians trouble themselves so little with ear diseases.

Perhaps the ear patients are less disturbed by their troubles, and consequently demand less interest on the part of the physician. Now, I do not wish to awaken the very old, and

in my opinion, very profitless strife, as to whether it is better to be deaf or blind; but it is certain that a noticeable loss of hearing power not only lessens the highest grade of life enjoyment, since it renders troublesome that noblest part of our life,—life among our fellows; but also, that not a few, through such a misfortune, are prevented from fully carrying on their business pursuit, certainly their power of doing so becomes somewhat limited. Think only, of the position of an army officer, teacher or public official, who has become hard of hearing. Often enough must such a one on this account give up his office; at least, an advancement in it will be much hindered. Again, a considerable loss of hearing power will prevent the merchant and mechanic to a considerable degree, in the pursuit of his avocations. But hardness of hearing more seriously affects the child, in preventing its full development. If it be of high degree, then the child, who does not hear the language, does not learn to speak at all, or if older, forgets the sound of the words, and in either case becomes completely dumb as well as deaf. I do not need to tell you that a deaf and dumb person, even under the best method of instruction, can never be made an equal, useful member of society. The lower grades of hardness of hearing also, if occurring in the early period of development, retain their influence upon the whole of the later existence. Not only that such children are with difficulty accustomed to concentrate their attention, that they remain inattentive and volatile, but also the absence of distinct intellectual impressions, which are mostly made through the ear, will never render a clear thinking power possible, a working together of the intellectual and physical powers. People who from early life have been somewhat hard of hearing, have generally something in their nature a little foggy, are uncertain, and weak in commercial pursuits, illogical and superfluous in thought and speech, abrupt and out of character in their answers.

"*Nil in intellectu quod non antea fuerit in sensu*," said Aristotle. If the physical appreciations are obscure, half way, and undecided, then the whole intellectual existence and character bears this stamp. In which way is the most of the educational material furnished to the child? Doubtless through the ear.

But in another view of the case, affections of the ear belong to a class of very disturbing complaints. Remember the subjective symptoms, the "noises in the ear" occurring in so many ear patients, in varied forms, and which to many are more troublesome than the deafness, and which cause such a sense-destroying effect, that it brings the sufferers almost on the borders of insanity. I call to your memory the dreadful pain which is connected with many inflammations of the ear, and which sometimes causes even the stolidest and most enduring men to shriek with pain. Still more, diseases of the ear, especially those connected with discharges, often end in death. Long continued and neglected diseases of the ear develop themselves, sometimes as abscesses of the brain, meningitis, pyœmia, as each one of you has seen in the Medical Clinic.

Thus we see that Diseases of the Ear arrange themselves among those classes of affections which exert the deepest and most energetic influence, and that this influence extends even to the intellectual development, and upon the lifetime of the individual. Certainly they have a greater influence in these respects than diseases of the eye. It cannot be their harmlessness which causes physicians to neglect them.

But we are told, "There can be nothing done for diseases of the ear." Shall we examine and see why there is nothing to be done for diseases of the ear? Perhaps the tissues of the ear, and therewith its lesions, differ from those we know in other parts of the human body, and are therefore fully removed from our medical appreciation and understanding.

The external auditory canal is covered with a continuation of the skin covering the body. The Drum of the ear, or Membrana tympani, consists of fibrous tissue; the covering of the middle ear, the Eustachian tube, the mastoid process, is formed from a mucous membrane, the continuation of the mucous membrane of the mouth. Finally, the internal ear, the labyrinth, consists as to its covered portion partly of connective tissue, partly of nerve fibres. The groundwork of the whole part consists of bone, partly dense, impermeable, partly porous. We find then, in the auditory canal, only the common tissue everywhere continued, and we must therefore consider it as having part in the pathological processes, everywhere occurring in other parts of the body. But perhaps the

parts lie so concealed and obscure, that we cannot recognise their affections, cannot make a diagnosis. This is again not the case. As we will later on more clearly see, the external auditory canal, and the membrana tympani, lie directly open to the view of the surgeon. The condition of the Eustachian tube, and of the cavity of the tympanum, we are able to know partly through direct physical perceptions, and partly from deductions from the condition of the membrana tympani, and the degree of the loss of function. The condition of the internal ear, we are able entirely to know, of course in no other way, than by exclusion or from probability. However, this is often the case in nervous diseases, and according to all the later observations this class of affections of the ear is quite rare.

We are able then to diagnosticate diseases of the ear, quite as well as many other classes of disease; certainly better than diseases of the kidneys, liver, or spleen, which, however, no one to whom they come would designate as affections in which there is nothing to be done. So much as refers to the diagnosis, refers also to the therapeutics, as has been seen, and which we will hereafter speak of in detail. Not considering that here, as in other cases, constitutional remedies are at our service, we know that the external surface of the membrana tympani and auditory canal are entirely accessible to local treatment, and we are enabled through the Eustachian tube, in various ways, to affect the middle ear.

If then we see that the number of ear patients is very large, and the consequences of ear diseases in every respect very important, since they extend an influence upon the life, happiness, and social position of the adult, but also on the intellectual development of the child, yea, they even often bring the life in danger; furthermore when we consider that we can find here no reason why the efforts of the physician cannot be as successful as in other branches of disease, considering all these things, it is peculiarly hard to understand why this branch of medical science has been so little attended to, in general entirely neglected. The more exactly we observe the thing, the more fails every fitting answer to the question, and we must consider the small estimation and want of interest with which even many of the most intelligent physicians consider

the whole province as entirely groundless, or based upon a wholly untenable position. It comes from traditional opinion, one determined from false reasoning, and a want of understanding of the subject, that affections of the ear have been disregarded, that very few physicians have attended to them, and finally that the scientific treatment of diseases of the ear, in its development, is far behind other specialities. This has not come to be the case, because there is little to be done; but because little *has* been done. Up to the present time scarcely a beginning has been made in the laying down of the ground principles of the practice, as has been effected in the other departments of exact medicine. But you ask—Have there not been attempts already made to show that it is true that "nothing can be done for diseases of the ear?" It is true, it has been said here and there, wherein lay the exceptional position of this branch of science, and why the treatment remains so far behind, and why this will always remain so. In my opinion, all these reasons are far behind the times, and we should wait with such decisions, which deny to medical science any advance in a certain direction, until a greater number of abler and educated men have undertaken the study of this science, and its basis, as an earnest lifework, and until at least the greater number of physicians have become acquainted with the necessary assisting remedies of the specialty. Nowhere has so little been done in medicine as exactly here, and therein it appears to me to lie, that so little progress has been made.

Before all things, we must labor in three directions, before that anything shall be accomplished in the Diagnosis and Treatment of Diseases of the Ear, if the science shall have any worth.

First. The pathological anatomy must receive more consideration, in order that we understand better the diseases which precede, and which lie at the basis of all functional disturbance.

Second. We must further, through pains-taking and careful physiological experiment, be in the position to know the parts of the ear in their relative importance in a normal as well as pathological condition.

Finally. We must seize and employ all exact methods of examination of the ear, so that each one may easily come to a

right understanding of its affections. We shall see in these several directions how much is still wanting, and it will be plain enough to appreciate in the course of our study together.

After these foregoing explanations more of a general nature, I have still to say, what plan I shall follow, and what you may expect from our coming together. I will endeavor to set forth the various affections which I recognise in the organ of hearing in their anatomical succession, picture these in their symptoms, and make you acquainted with their treatment. It will please me very much, if I shall succeed in exciting in you an abiding interest in the generally misunderstood, because unknown "Diseases of the Ear," and I know with certainty that if I shall, you will thereby be much more useful in your future life among men.

LECTURE II.[1]

THE EXAMINATION OF THE AUDITORY CANAL AND MEMBRANA TYMPANI.

The Diseases of the Cartilage of the Ear.—Importance of the Examination of the External Ear for Diagnosis, and for general knowledge of the parts.—The Ear Speculum.—The Illumination with the Concave Mirror as opposed to the former practised methods.—The Angular Forceps.

Gentlemen—We turn to-day to the diseases of the outer ear, under which name we include the auricle, and external auditory passage. The diseases of the auricle of the ear can be rightly passed by, since it is seldom affected alone, and if there are also affections of the surrounding parts, the appearances are in no way particularly marked. Before we, however, pass on to the diseases of the deeper lying parts, we must look at the means employed in diagnosticating them; we have then to consider the examination of the external auditory canal and the membrana tympani. It is not possible to make any correct diagnosis in diseases of the ear, without first being able to examine these two parts well. For a thorough inspection of these not only enables us to state their condition, but it also affords, at the same time, an explanation in respect to a number of deeper affections. The membrana tympani forms the partition wall between the auditory canal, and cavity of the tympanum, or middle ear, and the inner side of it contains a coating of the mucous membrane of the middle ear, and thus takes part in all the diseases of the cavity, and its coverings.

Then the pathological changes of the mucous membrane covering the tympanum exert an influence on this membrane; so that we can, from the knowledge of the condition of the one, safely diagnosticate as to the other.

Hence is it, that the examination of the auditory canal, and with it of the membrana tympani, constitute themselves our best diagnostic appliances. If I were to say to you, that in accordance with my experience, the greater number of surgeons are not in a position to appreciate what is to be seen in the outer ear, much less critically examine it, you will fully understand why the present position of the ear practice is so little satisfactory. It is an undeniable fact, that the greater number of practitioners cannot at all examine the ear, and scarcely is a secret made of such ignorance. This fact is of uncommonly vast importance. Yes, indeed, the evil position, on which the investigation of ear diseases to-day rests, may be traced back to this. Whoever does not know how to examine the ear, should not attempt a diagnosis of its affections; if he does not know what is the matter with the patient, he has no conception of what is to be done against the disease.

Each attempt at treatment, therefore, must remain without effect, unless a lucky chance should help. It is an old and psychological, and very easily understood adage, that we practise willingly and highly esteem what we understand, and feel ourselves safe in; and to reverse it, what we imperfectly understand, and where we are not at home, we do not like, and if possible push aside.

Some pains-taking physicians have openly confessed, that it is against their conscience to prescribe for an ear patient, for they cannot properly examine him, and they are ashamed to attempt to do anything for a patient without knowing what the disease is. Almost every physician is glad when he has got rid of an ear patient. The reason that physicians in general so little esteem the treatment in diseases of the ear, and assert this so openly at each opportunity, is because they think in this manner to be able to soften and palliate, before the world and themselves, the burdensome feeling of their own bad judgment. Very naturally, the very poor prospect for aid from physicians, was long since known to the lay public. Never do patients seek a physician so late as in ear diseases, and never do they so commonly try advertised books and remedies. Patients feel themselves without help from this quarter, where in other cases they find it, therefore quackery has a fair field. Because physicians have so little knowledge

of these affections, windy and superficial babblings can be palmed off as learned labors, and medical humbugs and phantasies draw out an existence on this territory.

You see, gentlemen, that we always come in a dreary circle, again to our starting point, viz. the fact that the profession, up to the present time, have not understood how to examine the ear; such being the case, we must find in this fact, a reasonable ground for the general unsatisfactory condition of the treatment of ear affections. What then is the ground of this improper position? Is the examination of the auditory canal and tympanum so particularly difficult, or were the previous methods not good and capable of being generally practised? In my opinion it is not in the difficulty, but in the method. That the previous ones are not good and practical in the full sense of the word, is sufficiently proved, from the fact that even now so few physicians can examine the ear. A really good method would have long since broken the way, and things for years past would have stood in a different position from that in which they unfortunately now are. The fact, that a great number of easily distinguished and very common changes and abnormal appearances in this membrane, concerning which we will speak more fully, have been entirely misunderstood by aurists, speaks still more of the uselessness of the previous methods. The errors can only be ascribed to the manner of examining. We turn now directly to the subject.

Without any assisting means, we can see only the opening of the auditory canal. If we pull the tragus a little forward, while at the same time we draw the concha backward, we widen the hole of entrance, and we are able to examine the first part of the passage. We are not able, in this manner, to look any deeper unless the canal is abnormally wide, which is very seldom the case. Generally, the auditory canal is too narrow to allow sufficient light to fall upon the deeper part and upon the membrana tympani; the canal does not run in a straight line, but it is angularly curved, and there are also little hairs in the way, which grow from the side of the bony part. If we wish to see the tympanum, the deepest lying part, fully and exactly, we must *remove* all these hindrances, in a word we must sufficiently illuminate the background, change the

crooked line of the canal to a straight one, and push the little hairs to one side.

All these requirements, we can in the simplest and best way attain, if we place a coniform tube in the passage, "ear speculum," and when prevented from the use of sunlight, by means of a mirror, see into the deepest part. These tubular, unopening specula, are to be preferred to Itard's or Kramer's ear specula, almost generally used in Germany. These latter are much larger and clumsier, not so convenient or easily adapted to their purpose. In general, all the widening of the bony canal that is necessary, can be accomplished from the coniform specula, and we have no use for the dilatation of an instrument, which, if pressed open while in the ear, easily causes pain. The use of this valvular speculum will also be sometimes contra-indicated because the little hairs and the epidermis are apt to *protrude through the sides, and obstruct the view.* This (Kramer's valvular-handled instrument) we must always hold as long as the examination lasts, while specula of the other kind, of the proper size, and properly placed, generally remain in position, while the hand is free for other manipulations.

Wilde's ear specula, which I generally use, are silver tubes, or blunted cones. Three different sizes are generally used, according to the size of the canal to be examined; these rest in each other, and can be conveniently carried in the vest pocket. Each speculum is about one and a half inches long, the greater opening three quarters of an inch diameter, the lesser, four lines. They should be very thinly and lightly constructed, and the lesser opening well rounded off, so that in placing it in the auditory canal no abrasion or wound may be made. It is a matter of less importance, whether they are polished externally or more or less darkened. In order to use these, the auricle is drawn somewhat backwards and upwards, and after the curvature of the canal is overcome, with the other hand the speculum, by a gentle motion, is placed so far in, as is possible without violence. When the instrument is in place the second hand is unnecessary, and the thumb, while the index and middle finger hold the upper part of the cartilage, is turned under the outer opening of the speculum.

In this manner, the speculum and auditory canal are held

in the proper manner, and can both be changed to different directions, in order to bring the membrana tympani and the different parts of the auditory canal, on all sides, into the field of vision. Beginners are apt to leave the ear to itself and hold the speculum alone; in this manner, we can easily press against the covering of the auditory canal, occasion pain, and prevent full use of the mobility of the speculum. If we then draw the speculum slowly out, we can see each part of the canal exactly.

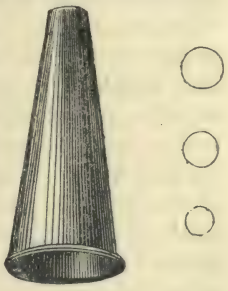


FIG. 1.

Of greater importance, is the question how can we best illuminate the auditory canal and membrana tympani? The valvular speculum is less convenient than the tubular one which I have described, yet we can well and thoroughly examine the ear with it, even if it be a little troublesome. It is not so, however, with the former methods of *illuminating* the ear, which prove themselves wholly insufficient. Until now, we have been in the habit of using only sunlight or bright daylight, falling through a window, into the canal, and down to its bottom. This method, still employed more than any other, is wholly impossible when there happens to be no sunlight.

Do not accustom yourself always to use it, even when it is to be obtained, only in certain cases. We cannot always see distinctly enough with it; moreover, it is not convenient. We learn from our daily experience with sunlight illumination, that it is a great deal too glaring and blinding in order to serve us where small and indistinct changes of form and color exist. It is an optical fact that direct sunlight, in general, is not so good for use, as broken and diffused light.

We could examine the ear better with simple immediate daylight, if there were not necessary such a number of favorable circumstances, working with us to secure the desired end. If we wish to make use of daylight, in examining a patient, he should be brought to the window. Bedridden patients in most cases cannot be thus taken. The window must be free from curtains, blinds, etc. If it does not look on the open sky, or opposite a house on which the sun shines, the light will not

be enough to illuminate the deeply lying parts of the ear. The position of the surgeon is a very bad one in this method of examination. He must stand between the light and the patient, and thus he easily makes a shadow with his head. This will more commonly occur when the surgeon is far-sighted. Indeed when little practice has been had, this making a shadow with the head of the surgeon, is very troublesome, precluding, as it does, the possibility of examining the drum of the ear. Moreover, since, for the foregoing reasons, the head of the surgeon cannot be very near the ear, minute changes, especially in the membrana tympani, may pass unnoticed even to the sharp-sighted; thus the method must always be confined to coarse distinctions. More than all, we cannot always have bright daylight at our service. In a climate so rich in clouds and rain as that of Germany and England, we must often wait weeks to find daylight enough to make an examination of the ear. This last is an evil position, which demands the introduction of another method; and one that does not depend upon weather. For how can we speak of a progressive, exact distinction and examination of a single case, if we cannot daily, and at any hour in the day, have at hand the means of such an examination? This great deficiency, the dependence of the illumination and examination upon the weather, upon the kindness of the skies, was naturally felt long ago, and it was attempted to help the matter by means of an apparatus furnishing artificial light.

The first attempts were made in the middle of the last century by an English army surgeon, Archibald Cleland. The surgeon held in his hand a large convex lens, the centre of which is opposite to a wax light, so that the united rays of light are thrown through the lens into the auditory canal.

All the illuminating apparatus which have been produced since this, possess no very great improvements on this, for its time, a very great advance. Instead of the convex lens, a concave one is used; instead of wax light, gas, oil, etc.*

Some of these appliances are exceedingly bunglingly contrived, and there are many of them which are still being

* For a more minute account of these appliances, see my brochure, "The Examination of the Auditory Canal and Membrana Tympani." "Die Untersuchung des Gehörgangs und Trommelfells." Berlin, 1860.

presented, which speak more for the ingenuity of the invention than for their practical worth. Those consisting of an artificial light, passed through a hole in a concave mirror, are still in constant use among many aurists. All these aids to examination have to do with an artificial colored light, which adds something foreign to the color of the parts, and does not allow the exact condition and color to appear.

But it is not necessary to have any artificial light, or complicated contrivances, in order to always obtain a strong, deeply reaching illumination of the canal and membrane. If we take a sufficiently large and strong concave mirror, and throw by means of it a strong stream of ordinary daylight upon the ear, we can see the parts clearly to the minutest portion, which with the naked eye is impossible, and this method sweeps away all the evils attending the other ones. The mirror must be of 5–6″ focal distance, and not less than 2½ to three inches in diameter. Metal mirrors are not so good as glass, and it is most convenient if they are perforated in the center, or the quicksilver covering can be removed at this point. The mirror of the ophthalmoscope is not adapted for this purpose, being too small and having too small a focal distance, and consequently we cannot detect minute changes. Coarser distinctions, such as if the membrana tympani is wholly or partially covered, grey or red, if the canal be stopped or free, we can generally well enough ascertain with the small mirror.

In certain cases, e.g. during operations, or the administration of an air bath, I fasten the mirror to the forehead, as in the use of the Laryngoscope. The use of the reflector enables you to turn the ear away from the window, the patient being between the window and the surgeon. We can examine adults most easily in the standing position; in the case of children the patient sits or places the little patient on a stool, so as to be parallel with him.

Since the ear lies in the middle of the head, we do well to lower it a little, or place it slightly to one side in order that no portion of the mirror may be shadowed. We very soon learn how to place the mirror and the patient, so that we have the very best point of illumination. If we give the mirror a slight motion to one side or the other we quickly find the best relative position of the deepest part. White or light grey clouds

afford here as with the microscope the best light. Sunlight thrown directly into the ear is too dazzling, and excites at the same time a distinct feeling of heat in the membrana tympani. If we find the sunlight, immediately opposite this, we turn the patient away to the other parts of the sky.

Experience will teach us, that this method of examination is preferable to all others, and that its advantages in opposition to those formerly practised are very great. The colorings of the part are not changed as with an artificial light; but are given back distinctly and truly. The necessary appliances* are simple, not costly, and portable. The greatest advantage, of this method of illumination, however, is that it may be practised in all kinds of weather, when the patient lies in bed (if necessary with a candle), and we are not obliged to turn the patient to a window if it be too far off, and a light colored wall be near.

Furthermore, the examination of the ear in this manner is easy and convenient, there is no danger of making a shadow with our heads, and we can yet come very near to the patient, and see clearly the smallest and finest distinctions in form and color. It is by no means difficult to learn this method of examination, and it has proved itself a good and practical one. (See Frontispiece.)

Another instrument is also necessary, in the examination of the ear, to remove scales of epidermis, cerumen, and similar little hindrances which, at the insertion or moving of the speculum, lie before the opening, and thus prevent a full view. We use for this purpose an angular forceps, with which we can take foreign bodies out of the canal, without putting our head in the light.

Since we may easily do damage to the walls of the canal, we must be careful not to use any force, and guard the patient against moving his head, during the operation; you will understand that no such attempt is to be made, unless we have the light under our control, and can see what we are about.

If there be any discharging secretion in the canal, or on the membrane, it may be removed by the use of a camel's hair pencil, introduced on the forceps. The different specula of Wilde, Toynbee, Gruber, Arlt, do not differ essentially, and

* They may be obtained at the surgical instrument manufacturers in New York.

are all to be preferred to the valvular. This last named was discovered in the seventeenth century by Fabrizius von Hilden, and is now known generally as Itard's or Kramer's speculum.

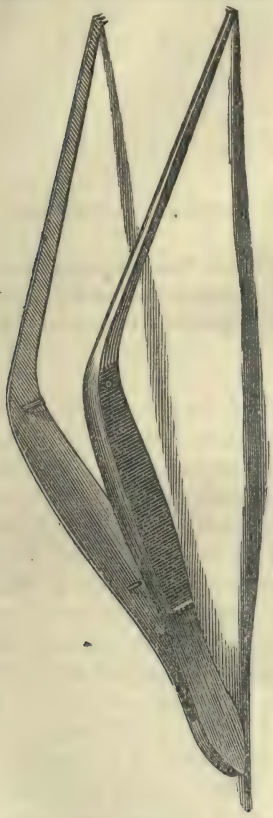


Fig. 2.

The above described method of illumination, with the concave mirror, I claim for myself, as not having heard anything of it from another, and I showed it in December, 1855, in the Union of German physicians, assembled in Paris. After this I learned that a similar method had been proposed before, by a physician from Westphalia, Dr. Hoffman, in Burgsteinfuhrt, in 1841, who recommended the use of a centrally perforated mirror, with which to throw sun or daylight into the ear, and thus to illuminate the parts. This suggestion of Hoffmann's does not seem, however, to have made any deep or lasting impression, nor to have been adopted by any of the known Aurists. It received so little attention that the most of the books on diseases of the ear make no mention of it; while I believe that this method of illumination is the only one which always and under all circumstances can be practised, with which alone a minute and careful examination can be made, and that the introduction of this method into general practice would make it possible that a more successful era of aural practice should be entered upon.

LECTURE III.

THE SECRETIONS OF THE AUDITORY CANAL, AND THEIR ANOMALIES.

Diminished Secretion of Cerumen.—Its Traditional Importance.—Plugs of Cerumen.—Their Gradual Accumulation and Sudden Manifestation.—Vertigo and other Symptoms.—Cases.—Prognosis and Treatment.

GENTLEMEN—In treating of the diseases of the external auditory canal, we have to speak, first, of its secretions and their anomalies. In the same way that tears are by no means only a secretory product of the lachrymal gland, but also, a product of the mucous membrane and Meibomian glands, so is it with the secretions of the auditory canal, which we call "ear wax." This substance is furnished not only by the proper ceruminous glands of the ear, which are very similar to the sudoriferous glands of the outer skin, but also by the other parts, in the skin of the canal, which also have secreting properties. The numerous sebaceous glands take part in the process, and there are also mixed with the ear wax, little hairs and dead scales of epidermis.

The covering of the external auditory canal is a continuation of the common covering of the body, which externally retains all its coarse and fine anatomical peculiarities, losing its glands and becoming thinner as it passes inward; and thus it can be easily understood, that the secretions of the auditory canal are commonly to be regarded as identical with those of the integument. This connexion or identity of the skin of the auditory canal with that of the body has been but little regarded, scarcely even noticed; consequently too great an importance has been attached to it, especially as to its quantity. We may also turn our attention to these views of the importance of an increase or diminution of the secretions of the ear, seeing if indeed there be so much.

We find the cerumen, or ear wax, generally very hard in persons whose skins are dry and bodies wanting in fat. Thomas Buchanan, a Scotch physician in the first part of this century, wrote several books, in which it was said that, absence of secretion in the auditory canal was the cause of a great number of cases of deafness, and he made the secretions of the ear to play a peculiar and important part. These observations, in their time, found scarcely any attention or acceptance, although the dryness of the auditory canal is considered as a very important circumstance, both with the laity and the profession, with reference to acute hearing; and as remedies, pencillings and droppings of oils and balsams are practised, among which applications glycerine has lately come into great repute. You will seldom see an ear patient, who either through his own or a physician's recommendation, has not tried some such remedy. We find also, in all the books on diseases of the ear up to the latest time, the absence of ceruminous secretion regarded as of itself a cause for hardness of hearing, and a symptom of a deeper affection of the auditory canal. The abnormal dryness of the auditory canal, by the latest aurists, is generally considered to have great importance in catarrh of the cavity of the tympanum, and nervous deafness.

A priori, we cannot deny that there is such a sympathy of the external auditory canal, and its secretions, with the deeper-lying parts of the ear, or that there is a certain physiological unity of the various parts; certainly they stand in dependence the one upon the other. We can trace such a sympathy back to an anatomical basis, since the otic ganglion sends branches to the mucous membrane of the cavity of the tympanum, as also to the covering of the auditory canal. But what does our experience, our cool unbiased observation teach us here? You must remember that very many ear patients very willingly ascribe the origin of their trouble to the accumulation of ear wax, and introduce ear spoons and such instruments; and in accordance with their own or a physician's recommendation, syringe the ear regularly. In this way an artificial dryness, a temporary absence of ear wax is produced. You should always inform yourself by questioning the patient, of the possibility of such a cause underlying the case. The examination of cases of chronic catarrh of the middle ear

shows us, that sometimes the cerumen is deficient, sometimes present in too great a quantity. In short, there is no absolute proportion. But we will see later on, on what a slender footing this absence of ear wax stands, in nervous deafness. Many surgeons say that in acute diseases, e.g. in acute catarrh of the middle ear, there is also deficiency in secretion. We cannot easily come to such a conclusion, for if the secretion went on normally before the attack, it is hardly possible that it has all suddenly disappeared. I hold to the belief that the idea, that deeper affections of the ear (we are of course not speaking of purulent affection) are regularly and proportionately connected with the diminution of secretion of cerumen, is purely traditional, and not confirmed by impartial observation. I can only ascribe the absence, diminution, or increase, as dependent upon the secretory power of the integument of the body. People who have an oily skin, people in whom the sudoriferous or sweat glands, especially of the head, are easily excited to action, have, as a rule, more cerumen in the ear than those whose skins are dryer and harsher. An insignificant quantity of ear wax is generally furnished. The superficial portion gradually becomes dry, and is lost, through the motion communicated to the cartilage of the canal, by the articulation of the lower jaw, also during the night in lying on the ear. If one has a vigorous secretion in the canal, more than ordinary being furnished, or than can be removed with the occasional aid of an ear spoon, or if there are circumstances which prevent the removal of the normally secreted wax, as is sometimes the case, in many cases of abnormal structure of the auditory canal, the secretion will gradually collect, and in a year can fully stop up the ear. The increased secretion of cerumen is by many authors referred to an acute inflammation of the canal. Kramer speaks of an inflammation of the cutis, whereby the ceruminous glands, lying under, are made to sympathize by an increased secretion of ear wax. Rau declares the increased secretion to be the result of an erythematous inflammation of the auditory canal. That hyperæmia of the canal, inflammation or congestive irritation of the integument, increases its secretion, is true, from the nature of things will not be denied, and later on we will see how often Eczema and Furuncle in the auditory canal is connected with an abnormally great secretion of

epidermis and cerumen. Such irritations, however, must not necessarily be ascribed to the collection of cerumen, and I am of the opinion that the greater number of cases of closure of the canal by inspissated cerumen, must not be regarded as consequences of any kinds of acute and specific disturbance of the nutritive process; but only as a consequence of year long accumulation of increased secretion, which for some reason or other was not removed. All the symptoms which such patients commonly speak of—a great buzzing and itching in the ear, or the correctly given feeling, as if the ear were stopped up—are to be regarded as mechanical effects of the increased ear wax, and not as proofs of the described abnormal process, which the authors speak of. This conception is much simpler and more natural, and invites a careful and unprejudiced observation. You have satisfied yourselves in our examinations which have lately begun, how different is the amount of cerumen secreted by different persons; and I call your attention to the fact, that the auditory canal of many of our students had only a very little, while in others we found such a mass on the side of the canal, that it even prevented a full view of the membrana tympani. In these latter cases we can reckon on a gradual stopping up of the canal, if the collection of the secretion be not hindered.

But the persons thus described were sure that they had good ears, heard perfectly well, and were not aware of any increase in the secretion. Interruption of the function of hearing will not show itself till the stoppage of the canal be complete. Such a deafness, arising from mechanical causes, excites a mass of other symptoms resulting from the pressure and irritation, which is made by the dilatation of the foreign body upon the walls of the canal, and on the membrana tympani. In many cases the effects of the accumulation of cerumen take place so suddenly, that a person who a short time before believed that he had a perfectly healthy ear, at once finds himself hard of hearing. This can be explained in the following manner. Through some accidental reason, e.g. softening of the plug by the pouring in of water, changing its position after a concussion, or the like, the closure of the canal is suddenly rendered complete, and in this manner the abnormal condition is made known.

An interesting case in which the relative worth of the history of the case, and the objective examination, are made known, is the following: An old man came out from a wine-house (bar-room), where he had taken an active part in the convivial proceedings, and on the way home struck against a wagon pole, awkwardly thrust out into the way, which knocked him down, striking his head upon the pavement. He thought that he lay there about fifteen minutes senseless. How far the fall or the several glasses of wine were to blame for this, he could not say; he admitted, however, to being a little intoxicated. However, he rose, and went home without difficulty. After a well passed night, he found in the morning that he was perfectly deaf. The physician who was called in, shook his head, and immediately ascribed the deafness to the fall, and striking the head on the pavement. He made a very serious matter of it to the family; it was a concussion or perhaps apoplexy of the cerebrum. The patient, who in other respects was well, was placed on light diet, cupped, and purged, and after a few days a seton was added to the remedies. The deafness remained the same. A month elapsed, during which the patient sank bodily and mentally under the treatment. I was called in at about this time. After I had heard the history, I examined, the ears, and found both canals fully stopped with cerumen. I caused this to be softened and removed by injecting warm water. In a few moments the patient heard perfectly well, and was cured, and not only from his deafness, but also from a "deep cloudiness of his intellect," which had occurred since the "concussion of the brain." Here the fall had displaced the already collected, but not yet observed mass of cerumen, so that the canal was immediately hermetically closed, hence the sudden deafness. Remember this case, gentlemen, when patients come to you, who present symptoms which can also possibly be referred to the ear, and think what an opinion this intellect-clouded, medicine-tormented, seton-bothered, and easily healed patient, must have had of his otherwise skilful physician, when the nature of the cerebral disease was made clear to both. Let us suppose that a few days after the application of the seton, the mass of wax, through any accident, had removed its position, or the physician had thought of applying electricity, and accordingly had placed warm water

in the ear, or if olive oil had been dropped in, and some of the cerumen removed, what a new proof would have been furnished of the effect of the remedies in cerebral deafness.

Many patients affected with impaction of cerumen, tell us, that their condition varies in accordance with certain influences. Many say that they become deaf, as quickly as they lie on the ear, and thereby press on it, and the deafness disappears as quickly as they rise and shake the head, or pull the ear. Others become deaf each morning as soon as they wash the ear, or clean it with a handkerchief. These are all circumstances which go to prove to us, how masses of cerumen are affected by change of position; and that the hearing power is first markedly disturbed, when it completely closes the auditory canal. Exceptionally, small quantities of cerumen can cause troublesome symptoms if it makes in the course of the auditory canal a thin but nevertheless complete partition wall; or still more, when through any accident a thin flake lies on the membrana tympani, and therewith causes pressure and irritation.

I was once consulted by a patient, who, in consequence of deafness, had been treated for some time by injections of the ear. He had thus removed a considerable quantity of cerumen; but in spite of it the deafness returned, and the buzzing sound greatly increased, and there was added to it severe pain and dizziness. The physician, who was little practised in diseases of the ear, could not clear up these symptoms, and sent the patient to me. I found the auditory canal free; only a very small flake of dark-looking cerumen, disk-shaped, lay on the membrana tympani, by which it was entirely covered. I filled the ear with warm water, caused the patient to lie for some moments on the other side, and was able to remove the softened ear wax with a camel's hair brush. It caused for a moment a very severe buzzing in the ear, on account of the touching the drum, but all the symptoms afterwards subsided.

The dizziness that is sometimes occasioned by plugs of cerumen in the ear is very peculiar. We will again meet with this symptom in other affections of the ear. It has not as yet been fully comprehended, that dizziness or vertigo can result from affections of the ear. Many patients hard of hearing, and suffering from this symptom, having been called "nervous"

and cerebral patients, have been sent the rounds of constitutional treatment at the springs, drinking vegetable decoctions, and finally have suffered from setons and the moxa, while the symptom should have been traced to the ear, and then perhaps could have been treated with some success.

Wads of cotton, etc., which are often introduced into the ear, form the nucleus of a formation with which the auditory canal is sometimes stopped. It is not seldom that we find in the midst of cerumen, a mass of little hairs, such as grow in the anterior portion of the canal, and such a discovery speaks for a very long continuation of the accumulation, it may be for ten years. Cerumen filled with such masses of hair, is found most generally in elderly persons, and this occurs not only because more time is given for their growth, but also, because very often a collapse of the walls of the passage takes place, and a slit-shaped canal is thus made, and thus the removal of cerumen more or less hindered.

Such masses, however, accumulate in every time of life, even in childhood. In the last named case, there is always much epidermis mixed with it, and the mass has a light yellow color. Persons who have a very open, that is with sides widely separated, auditory canal, who suffer from a kind of catarrh of the part, are especially liable to the formation of these masses. I know the case of a young laborer, from whose ears I have removed these obstructions several times in the course of a year. Sometimes they consist of disk-shaped lamellæ of epidermis, which are colored yellow or brown by a small quantity of cerumen mingled with it. Such cases cause us to ask, if in connexion with these there be not also a congestive irritation of the epidermis. You are generally able, in these cases, to distinguish old from new formations. The latter are peripheral in situation, are of a light color, are richly mingled with epidermis, and often show on the shining surface, resembling mother of pearl, a mixture of cholesterin crystals, while the older appear more amorphous and darker in color.

Stopping of the ears with cerumen often takes place in both ears, in different grades of the formation, so that, for instance, in one ear, when complete stoppage has occurred, the patient is entirely deaf, while he thinks he hears normally well in the other, where only a crevice remains unfilled.

These plugs of cerumen are by no means always of a harmless nature, but through their great extent and consequent mischievous pressure, may work great damage upon the neighboring parts. Thus I made a post-mortem examination in a case,* when such a mass filled the whole auditory passage, certainly a very old mass, and had caused a dilation of all sides of the canal, and a perforation of the membrana tympani, so that a part reached into the cavity of the tympanum.

Toynbee has had several opportunities to learn the evil effects which such masses cause to the neighboring parts.

More than once, after the removal of such masses, I have seen the membrana tympani lying inwards, as if it had been pressed in this direction for some time.

We should certainly be guarded in our prognosis, not immediately giving a favorable one, when we meet with such a collection, since the complications may often be so various and many.†

From the foregoing it is evident that the surgeon, in the removal of these masses, must act slowly and with care, for he cannot know in what condition the deeper parts may be. You will never then begin with the use of forceps, ear spoons, etc., by which the plug is easily pushed inwards, and great pain and other results caused to the patient. The only proper method to be adopted, is the use of warm water injected, with which, however, we must use no violence. If the mass proves to be very hard, or the patient troublesome, we can fill the ear with warm water, and allow it to remain some time upon the plug, thus softening it, repeating the operation as often as may be necessary, and thus it may be easily loosened and swept out by the subsequent injections. Do not neglect to say to your patient to whom you intrust such a course of treatment, that this leaving water in the ear may cause his deafness to increase, lest on following your advice he becomes worse and fails to return.

* Vide the Author's Beiträge zur Ohrenheilkunde, Contributions to Diseases of the Ear, Virchow's Archives, vol. xvi.; Sec. II. p. 10.

† Toynbee, Diseases of the Ear, London, 1860, p. 48, of 160 ears where he had removed such masses, gives only sixty, where the hearing power was completely restored, in forty-three considerably improved, in the remaining sixty-two none or a very little improvement. The result of my observations has been similar.

Oil and glycerine do not appear to loosen the masses so well as simple warm water. As the result of the syringing the mass is removed, very often in a large lump entire, and we are able to take it out, as it nears the meatus, with a forceps; sometimes thus we obtain a correct cast of the canal, on which we can see the figure of the outer surface of the membrana tympani.

For a day after the mass is removed it is well to guard the ear from cold and wind, by the introduction of a small piece of cotton. Those who are restored to hearing, after having been for a long time robbed of that sense, cannot bear great sounds, a loud voice being often very unpleasant to them. There is a slight congestion of the membrana tympani, and of the walls of the canal, immediately after the syringing, but this disappears in a few hours.

LECTURE IV.

SYRINGING THE EAR. FOREIGN BODIES IN THE EAR.

The Ear Syringe and Method of Use.—Some Methods of Removal of Foreign Bodies, more dangerous than the Substances themselves. —Methods of Procedure in Doubtful Cases.—Foreign Bodies in the Ear, often the cause of Peculiar Reflex Symptoms.— Cases.

GENTLEMEN—A professor in an eminent medical faculty, to whom I announced my purpose to busy myself with the investigation and treatment of "Diseases of the Ear," answered me at once (of course, this was years ago) with a smile: "There is nothing more to do with ear cases than to syringe the ears, and put on a blister." Many intelligent and learned practitioners ascribe a similar high and universal value to syringing the ear. Perhaps then I may be excused, if I devote a few words to this simple procedure.

Simple as it is, we will be able to satisfy ourselves, that very often physicians themselves cannot properly syringe the ear, and that there are medical schools where you may listen in vain for a passing word of instruction on the subject. But the thing is by no means an immaterial one. It is not only true that many patients by this simple process are immediately cured, but it is also true that there is a large number of patients, for instance those suffering from Otorrhœa, which before all things requires a regular removal of the secretion, if we would keep the process at a stand-still or improve it. We will later on inquire into all the circumstances which require a systematic and constant syringing of the ear, and we will learn that they are often cases which are accompanied by pain, and which *often* lead to Death. You see then, gentlemen, that much may depend on the knowledge of the proper time for syringing, and its proper manner. The subject is indeed very important in another sense than the one noticed above.

Fig. 3.

I show you here the instrument which I use, and which I also recommend to patients for their own use. It is of pewter or tin, has on its end a ring for withdrawing the piston, and has a blunt coniform extremity of bone. The portion lying next to the ring, and which unscrews, is somewhat broader and more projecting, so as to afford a place for the two fingers to hold the syringe. The two rings at the side which many aurists have seem to me superfluous. As we seldom need a long continued stream of water, or great power of the stream, smaller syringes are greatly to be preferred to larger. (Dr. Holcomb of this city has suggested the placing a tube of gutta-percha over the end of the syringe, and I find it useful and safe.) As I have already said, I recommend this instrument to patients for their own use. I think horn and glass syringes the least practical. All the long tapering pointed instruments should be avoided, for the patient can easily do injury to the auditory canal with them, while the blunt point can be introduced without danger as far as it will go.

In using the syringe, we remember the curvature of the canal, and that when we do not draw the cartilage upwards and backwards, only the upper wall will be washed, while the deeper part and drum of the ear will be scarcely touched by the water. We take hold, then, of the cartilage of the ear with the left hand, as we have seen in the introduction of the speculum.

If you would be sure that the patient at home uses the syringe properly, you must give the necessary instructions. Many cases of otorrhœa are not cured, simply because the syringing is not done properly, that is, the secretion removed. The syringing must be done slowly, and without force, which we

must especially avoid in inflammations of the deeper parts, for these having become relaxed by the inflammatory process, may easily suffer injury. It is not to be doubted that a softened membrana tympani can be broken through by too strong a stream of water, and the ossicula auditûs loosened from their connexion with a carious cavity of the tympanum, and that corroded walls can meet with further damage.

Even when the membrana tympani is not relaxed, the syringing, be it ever so carefully performed, may excite a feeling of faintness, of dizziness, quickly passing away, which faintness, according to the invariable statement of patients, is not preceded by pain.

Syringing the ear can only have one end in view, and that end is the removal of something from the ear, be it pus, inspissated cerumen, or any kind of a foreign body. When the examination has not shown us something to be removed, we should not attempt syringing. You may wonder that I say this to you, when it seems an axiom. You will wonder the more when, in your practice, you find that almost every ear patient, for whom you have not first prescribed, has been ordered to syringe the ear. The patients will often earnestly and truly inform you that nothing had been removed.

You will see, then, that many physicians employ syringing as a diagnostic resource, in order to learn if the deafness do not depend on a collection of cerumen; many also if the membrana tympani had not a hole in it. The patient has often a not inconsiderable evil added to his original trouble by such careless injections, especially if it be done too briskly, or, as is sometimes practised, very strong tea used. I have seen inflammations of the auditory canal, and of the membrana tympani, arising in such a way.

We should never use cold water, only lukewarm, in the injection of the ear, the part being intolerant of anything cold. Anything more than water is not necessary.

We turn now to the consideration of Foreign Bodies in the Ear. This chapter will lead us to speak less of the real importance of the subject, than of assumed and accredited. Children occasionally stick in the ear glass beads, fruit stones, and the like; moreover sometimes insects creep into the ear of older persons, and disquiet them through

their presence. Generally the presence of these bodies in the ear is less injurious than the attempts to remove them. We may take for a motto the old proverb. "Blind zeal only does harm" (Blinder Eifer schadet nur). Really, we can but wonder how commonly the energetic methods of examination are undertaken by physicians as well as laymen, to see if the patient be really in the right, and a foreign body is in the auditory canal. There are some severe incidents of these circumstances, and the consequence of such unnecessary attempts, in Wilde's Aural Surgery, and such cases often lead to a tragic ending. In my own practice I remember two cases in point.

I was once called out of bed by a servant girl, who with a woful countenance, and tears in her eyes, told me that an "Ohrenhöllerer," the popular name in Franconia for earwig (*Forficula* auricularis), had crept into the ear, and that some persons had introduced a blade of straw in order to remove it. Luckily there lived a young surgeon in the house, who was also called, and by means of a pair of forceps took part in the search. He assured her that the animal was removed, but as she in the night had been attacked with severe pain in the ear, she thought the insect must be there. I illuminated the ear by means of a concave mirror and study lamp, and found certainly no insect, but a very much reddened auditory canal, and intensely injected membrana tympani, naturally the consequence of the search.

A more serious case was the following: A young girl in the country, in sport one evening, had placed in her ear by her lover, a small piece of bread, which could not be removed. A surgeon, who was called in the night, looked for the foreign body by means of a probe, forceps, and scissors, and injected the ear with cold water. These attempts to get possession of the piece of bread, renewed several times, were at last obliged to be stopped, because a considerable bleeding from the ear resulted, and the patient, who had borne up well till then, declared that she could endure the pain no longer. To remove the inflammation cold water was applied to the ear for several hours. Some days after, I first saw the patient, and found a very severe and extensive inflammation of the auditory canal, it being very much swollen. In spite of energetic antiphlo-

gistic treatment, the inflammation did not subside, several subcutaneous abscesses appeared in the depth of the auditory canal, and the local and general symptoms became so threatening, that I was for some days very anxious for the life of the patient.

The inflammation gradually, however, abated, and in about four weeks she was able to leave her room. I confess this was a little too much for a piece of bread. I would leave such a foreign body to itself, for I cannot see how its presence would do harm, and it would probably during the night or following day go out of itself. If an insect or other animal creeps into the ear, then the simplest and best thing to do, would be to fill the ear with water. The animal being thus inconvenienced, would creep out of itself (or be drowned and fall out). A great surgeon of our day, *Malgaigne*, recommends catching an animal which has crept into the ear, with a camel's hair pencil dipped in glue, and *Verduc*, to bait it with a piece of golden apple. *Hyrtl* well remarks that such remedies are too great burlesques for the serious mechanism of the surgeon. We can scarcely believe what ridiculous and laughable expedients have been suggested for the removal of foreign bodies from the ear. Thus the well known *Itard* recommends leaving seeds in the ear till they have sprouted, and then removing them by the sprouts. *Bermond* (1834) reported that he had removed a bean by placing a leech upon it. *Rau*,* from whom I take the last example, considers it as calling to mind the experience of *Arculanus* (1493), who recommended to put the head of a freshly killed lizard in the ear. Three hours after the insect would be found in the mouth of the lizard. There is also a great number of forceps, nooses, perforators, etc., for the removal of foreign bodies from the ear. Some of them, of very complicated construction, and their number does not diminish even at this day. It is true that there is considerable room between the figure of a bead, and the oval or ellipsoidal contour of the auditory canal, so that a small lever can be introduced under the offending body. In such cases, however, injected water will also collect behind the body, and wash it out, or dislodge it so that the removal can be completed with my angled forceps, or with any thin and

* Text Book for Diseases of the Ear. Berlin, 1856, p. 376. "Lehr Buch der Ohrenheilkunde."

broad body; best, however, with a thin and broad lever, such as is found on the handle of Daviel's Spoon. If, however, there is no room between the walls of the auditory canal and the foreign body, we will only incur danger with any one of these instruments, i.e. danger of lacerating the wall of the passage, or of sinking the body still deeper, and of pressing it against the drum of the ear, whereby the condition of things will be made considerably worse. When there is no danger from delay, I would quiet the patient and those about him, set a leech or two on the meatus, if there be inflammatory symptoms, and afterwards cold applications. If, however, the swelling of the auditory canal does not disappear, and if after repeated syringing it is impossible to remove the foreign body, I would try if cataplasms developing suppuration would not bring it to the surface. If a case came under my observation where a wedged-in body produced such symptoms, that an energetic treatment for its removal was indicated, and delay as above recommended was not practicable, I would hasten to remove it by an operation, in which an opening should be made through the wall of the auditory canal, allowing us to fasten on the body from behind, and thus remove it. Paul von Aegina (1533), and the ancient surgeons recommended in such circumstances, in cases of necessity, immediately to make a crescent-shaped incision behind the ear; and *Hyrtl* calls particular attention to this method, which has been abandoned by *Malgaigne*, *Rau*, and others. I agree fully with the principle involved in this operation, although I would not enter from behind, but from above, thus choosing another position for the incision, and this for many reasons.

The posterior auricular artery runs immediately behind the pinna or cartilage of the ear, in the angle which it makes with the neck; this is quite a large vessel, and this is the point indicated for an incision. In incising here, one could hardly avoid doing injury to the vessel. Furthermore, we will be prevented from separating the concha, and the cartilaginous portion of the auditory canal, on account of the prominence of the mastoid process, and are not able therefore with a bent instrument to go far enough. I have, however, satisfied myself on the dead body, that we can easily separate the auditory canal from the squamous portion of the temporal bone, and thus

with a bent aneurism needle, reach down to the membrana tympani. This operation is doubly easy in children, where there is scarcely any bony canal, and by the sinking in of the temporal bone, out of which the upper wall gradually forms itself, there is presented a very great inclined plane, so that it leads to the drum of the ear in a very obtuse open angle. In children, therefore, and here the cases occur most commonly, and sometimes the foreign bodies are pushed in further, by the efforts of a teacher or others to remove them, we can get at them from above, through the soft tender parts, reaching the membrana tympani, and the operation is less terrible and far safer than the commonly advised method. It is evident, gentlemen, that such a procedure must be reserved for cases of the most pressing necessity. Once more, never forget to assure yourselves that the story of the patient is true; see if perhaps the auditory canal is not already free, and the symptoms are the result of attempts at extraction previously made.

Furthermore, do not attach more importance to foreign bodies in the ear than really belongs to them, and try faithfully with syringing if you are not able to remove the body.

Our aged fellow-countryman, the accomplished physician for the city in Nuremburg, says: "Chirurgus menti prius et oculo agat, quam manu armata," in German, "Der Arzt muss zuerst überlegen und untersuchen, bevor er operirt." The surgeon must look with eyes and mind before he operates. (I may here give the synopsis of a case belonging to this subject, which occurred while with my regiment in Pennsylvania in June of this year, and which appeared in the *American Medical Times*. A sentry, while standing guard before the hospital tent, suddenly felt a bug creep into his ear. It occasioned vertigo, causing him to almost fall, and severe pain. I was not sent for, but attempts were made by non-medical men to remove it with forceps, etc., of course, with no knowledge of the situation of the bug. The attempt failed. The subsequent treatment when the case came to the assistant surgeon was antiphlogistic, as considerable inflammatory symptoms had arisen, use of warm water. The subjective symptoms continued for ten days. I had no speculum in the army pannier, with which to make a sufficient examination, and on the tenth day the bug was removed by a long continued syringing.)

I would like now to call your attention to a class of cases which demand a careful regard. I would ask you to look for the explanation of many seemingly far removed cases of disturbances of the system in the ear, since the effects of irritation of the auditory canal, especially those from the long continued presence of foreign bodies, often locate themselves in other nerve channels, and are capable of making a long continued source of trouble. You all very well know, that contact with the auditory canal often produces tickling in the throat, and that the introduction of an ear speculum causes many persons to cough. You know that these reflex nervous phenomena must depend on the supply of nerve material from the pneumo-gastric to the epidermis of the auditory canal. We have also seen that some persons experience sensations of dizziness in syringing the ear, and that masses of cerumen pressing on the ear can also excite such symptoms. Such patients are considered as suffering from cerebral disease. *Pechlin* has observed a case, in which touching the external auditory canal excited severe vomiting; and *Arnold* tells of a girl who suffered from a severe cough and expectoration, often returning, and thereby visibly emaciating her. On closer examination she confessed that she placed a bean in each ear, as she had been advised to, on account of noises in the head. The removal of these beans was accompanied by severe coughing, vomiting, and sneezing. The symptoms then ceased, and the girl fully recovered.*

In a case observed by *Toynbee*, the patient suffered from severe cough, which was not alleviated by treatment, but which ceased as soon as a piece of necrosed bone was removed from the auditory canal. *Boyer* relates a case from the practice of Fabrizius von Hilden, where a girl who suffered from epilepsy, atrophy of one arm, and anesthesia of an entire half of the body, was cured from all of these symptoms by the removal of a glass ball from the ear, which she had placed there eight years before.† *Wilde* relates a case of epilepsy and deafness, which, according to the view of the observer, arose from the presence of a foreign body in the ear, and was

* Romberg's Text Book of Nervous Diseases. Berlin, 1851, vol. ii., p. 130.

† Boyer, Surgical Diseases. Wurzburg, 1821, vol. vi., p. 10.

relieved by its removal. It is well known that epilepsy and other nervous diseases can occur as reflex symptoms, and from the pathological irritation of peripheral nerves, as well as from the irritation of the nerve centre itself.

When we consider these facts, and the supply of the ear, in sensory branches from the trigeminus and pneumo-gastric, taken in connexion with the above experience, we will not too generally assign other causes for extraordinary symptoms, until we ascertain if there be not a possibility of their arising from the ear.

Later on, in the course of our meeting together, we will speak more fully of the general symptoms, which are more or less connected with affections of the ear.

From a consideration of all these facts, gentlemen, I do not believe myself presumptuous, when I hope there is a day coming, when, in a considerable number of diseases, intelligent surgeons will consider the ear as well as the pupil as a part to be always examined.

LECTURE V.

FURUNCLES IN THE AUDITORY CANAL. BLOOD-LETTING IN EAR DISEASES.

Symptoms, Course, and Treatment of Furuncle.—Place of Blood-Letting, in accordance with the Situation of the Affection.—Some Rules for the Use of Leeches.

GENTLEMEN—In coming to-day to speak of the inflammation of the auditory canal, we must notice first, Follicular Abscesses or Furuncles.

Furuncles of the auditory canal are exactly similar in their nature to the Furuncles which so commonly appear in other parts of the body. It is well known that this form of abscess distinguishes itself from other in that the Furuncle has in its centre a circumscribed "core," which is formed from dead connective tissue, and also from a diseased hair cyst. The inflammation generally begins in the hair cyst, and as a consequence of the profuse formation of pus, this cyst, as also the connective tissue about, is destroyed.

A so called demarcated, or circumscribed inflammation develops itself about this "core," and thus furnishes still more purulent matter; since, however, the central mass of connective tissue becomes fully separated, the furuncle presents a great similarity to an abscess.

These circumscribed abscesses may be described as swellings of varied size; flat round in shape, of firm consistence, with broad bases, and without a well defined border, proceeding from the integument of the auditory canal. Their color often scarcely changed from that of the skin, seldom more than a pale red, always very tender to the touch; the surrounding parts are more or less swollen, so that a complete closure of the auditory canal, and with it hardness of hearing or deafness, may occur. Sometimes the borders of the swelling are so little to be

distinguished, or the meatus auditorius externus so extremely slit-formed, that we can with difficulty find and designate the exact position of the abscess. Several furuncles often appear near each other, whereby the symptoms are very naturally increased. The subjective symptoms from such follicular abscesses are as various as those occurring in other parts of the body, according to position and extent. In the beginning the patient experiences little more than a troublesome fulness in the ear, as if the ear were stopped up. Soon severe pain occurs, extending from the ear to all the surrounding parts, occurring in chewing, speaking, and in other movements of the under jaw, and this pain always increases at night. The patient complains of a feeling of extreme tension in the ear, of a continual noise of pounding and hammering in the head, and the patient cannot lie on the affected side; because at each motion unbearable pain is occasioned. In such cases, the unrest and excitement easily change to a state of fever, and I have been before now called to patients, whose countenance and statement would have induced me to fear inflammation of the middle ear as the cause, instead of simple furuncle of the auditory canal. The symptoms are uncommonly various, even when the inflammatory symptoms are equally extended over the auditory canal, owing to the peculiar formation of the cartilaginous portion, which, as you remember, is to a certain degree like that of the trachea, since it has a number of gaps, or fissures, filled only with fibrous tissue, "incisuræ Santorini."

Furthermore, on the upper wall a stocking-shaped piece of integument reaches into the bony part of the canal, and this has just as dense connective tissue, glands and hair cysts as any other part. If now, furuncles should occur in such a position, when the inflamed, swollen, connective tissue cannot be exposed, and when it quickly reaches a firm unyielding basis, viz. the bone, the symptoms depending on tension of the connective tissue will be much severer, while if we reverse the case, such a follicular abscess will be little noticed, if it be situated at the entrance of the auditory canal or other similar favorable positions.

Furuncle of the auditory canal appears in every age, and in the most different kinds of constitution. They often occur as complications of otorrhœa, when frequent syringing is made

use of, and also when the affection is left entirely to itself. A lotion of alum appears to produce them. A young medical man whom I treated with an obstinate case of inflammation of the membrana tympani, with purulent discharge, and whom I advised the use of the above named astringent, and in order to produce a full effect to leave it in the ear during the whole night, closing the ear and sleeping on the other side, had regularly, as often as he tried this remedy, a small abscess in the auditory canal, while he could use the same astringent for months if he left it in but a short time.

As to the course of this affection, resolution sometimes occurs without there being a discharge of pus; generally, however, a thin yellow point forms, and an opening follows from three to six days from the beginning of the attack. Then the scene ends, and at one stroke all the disturbing symptoms disappear, if a new furuncle does not immediately set in. The contents are generally a few drops of thick pus, and a fatty or flocculent mass, which we can commonly obtain by pressure on the walls of the abscess. The discharge of pus soon ceases; just before the opening we find the surface covered with a smeary moistness.

The Prognosis should be stated as a thoroughly good one, if we except therefrom the fact, that often many such abscesses follow each other in a more or less rapid succession. It is well, then, to tell this to the patient if only one has occurred; or this frequent return of such abscesses, continuing even through a long period of time, may become in the highest degree annoying, and a real source of trouble, although in themselves they are unimportant and without consequence.

I once treated a man, who for twelve years long, with intervals of two weeks, and at the highest two months, suffered from such furuncles, now in one, now in the other ear; and with which there was always general febrile disturbance, so that at each attack he was obliged to lie some days in bed, and thus on account of this affection hindered in his business, which was that of cattle-dealer.

Almost all persons who complain of frequently recurring year-long-continuing furuncles in the auditory canal, are in other respects entirely well, some of them even of strong constitution, in the prime of life, more females than male.

Treatment.— *Wilde* speaks highly of the use of nitrate of silver, as an abortive remedy. If the inflammation has just begun, he thinks by this means to have often cut short the process, and prevented the formation of pus. I have no experience in the remedy, yet I would think it worth the trial, in many cases. Warm, greasy applications are of service in these cases, because they decrease the tension, and hasten resolution.

Fig. 4.

We may fill the ear with warm water when it is possible to do so, more than is already done by the furuncle, place a small cataplasm upon the ear, or let the steam from a vessel of warm water stream against the affected part. (This last named will be found, I think, the most efficient and soothing remedy. Let some aromatic infusion be made, as for instance of catnip (cataria). The steam of this will be very grateful.) If any constitutional disturbance exist, give a saline cathartic, I have not generally found leeches necessary. If used, they should be applied near the meatus, just in front of the tragus.

I incise the furuncle as quick as possible, not waiting by any means for the formation of pus; the quicker we use the knife, the better. If a complete abscess has formed, the pus is discharged, and all the pain ceases therewith. If, however, it has not gone so far, generally the process is cut short, or at least the further severe pain is spared the patient. The incision should be deep and free. The skin of the cartilaginous part of the auditory canal is very dense and somewhat thick, therefore the knife must be used with some force. A slender, tapering pointed bistoury with a long handle, which has on the other extremity a Davielschen spoon, as used in extraction of cataract, with which to complete the emptying of the abscess, has proved very serviceable to me in this and similar incisions.

This little spoon can be used instead of a probe in finding the situation of the abscess, which cannot always, as has been already shown, be discerned with the eye. If we have found the most painful spot, this is the one to be cut, and the instru-

ment should be immediately reversed, and the incision made without giving the patient the pain of awaiting it. The cutting does not cause half so much pain as the knowledge that the next thing is the cutting, and with all over anxious knife-fearing patients, if you stop to parley you will end with the same. Immediately following a rightly located incision, a great relief is experienced, even when no pus is evacuated, through the relaxation of the parts, and also through the blood-letting, which is sometimes not inconsiderable. We inject immediately after opening the abscess warm water in the ear, in order to expedite the removal of blood and pus, and advise the patient to continue the warm vapor, in order that the swelling may quickly and entirely disappear. You will, of course, understand that you are not to make an incision, which is always a painful thing, if the patient is scarcely troubled on account of the furuncle, and if you see from its situation that it will cause little inconvenience. Always advise such patients to visit you a week later, or to once carefully syringe the ear, at about that lapse of time, because after a furuncle, still more so after a series of them, increased secretion of epidermis and cerumen occurs, whereby a closure of the auditory canal may occur. It is also well to remember that this discharge may be an inducement to the formation of subsequent abscesses, perhaps though irritation of the hair cyst, or stoppage of the exit of the ceruminous glands. It is entirely wrong, however, as many patients are advised, to syringe the ear without cause, after furuncles have been present.

(When these pages were ready for the press, a case occurring in the practice of my friend Professor Post of this city, which seems of enough interest to be inserted here, came to my knowledge. The Doctor was sent for to see a lady suffering from swelling and pain in the ear. He found it to be a case of phlegmonous inflammation, situated in the meatus auditorius externus, which had existed for some days with agonizing pain. Following his usual practice, he determined to make an incision, which was done, giving some relief, but not the usual amount of immediate freedom from pain. There happened to be a gentleman in the same house suffering from the same affection. The professor immediately opened this also, and immediately, or within a very few minutes, complete relief

was experienced. It was nearly dark, and from the hæmorrhage occurring from the incision in the first case, an examination of the external canal was not practicable; but Dr. Post expressed the opinion that there was another abscess in the meatus, and that this was the reason the pain was not so completely relieved in the case of the lady as in the gentleman. Subsequent examination proved this to be true, when an incision was made and full relief followed. Too much stress cannot be laid upon the necessity for early incisions in these cases. The patients will thank you for them, and condemn those who attempt to wait for a natural opening, as so many physicians are inclined to do).

As to constitutional treatment, I have tried the mineral springs and other constitutional treatment to prevent their return, but as yet have found them of no effect.

In the following lectures, we will speak of blood-letting, and of the use of leeches, in affections of the ear, and I will now speak more particularly concerning the method. Local blood-letting, in some inflammations of the ear, is a very powerful remedy, and I know of none, when you have such an immediate effect; nevertheless it requires to be used rightly, with observance of certain rules, and careful observation, or it will do no good, on the contrary, harm. You will generally find the mastoid process chosen as the place at which to apply a leech. *Wilde* first called attention to the fact, that in the most painful of ear affections, and these are inflammations of the external auditory canal, and of the membrana tympani, a small number of leeches applied on the meatus do much more good than a greater number applied behind the ear. The recent observations which I have made on the course and origin of the vessels of the external surface of the drum of the ear, furnish us with the anatomical reason for this fact.

For we know, that the external auditory canal and membrana tympani derive the greater portion of their common blood supply from the branches of the *art. auricularis profunda*, which runs behind the condyloid process of the under jaw, i.e. in front of the meatus auditorius externus, and supplies first the tragus, and anterior part of the auditory canal. In front of the meatus also lies the *vena auricularis profunda*, the chief vein of the outer ear. If we will then in any affection

draw blood from the part nourishing the external ear, we will select, not the mastoid process, but the meatus, especially the tragus, and the vicinity immediately about it. It is, however, difficult to accomplish this in deeper affections, e.g. of the cavity of the tympanum. In such cases, where, however, we have not much to hope for from blood-letting, we can make the application on the mastoid process, and in front of the ear, since we learn from anatomy the cavity of the tympanum and the neighboring bones draw their blood supply from various sides, partly from the tympanic artery, which passes through the glaserian fissure, i.e. at the articulation of the jaw, and from the stylo-mastoid, which enters under the meatus into the fallopian canal.

The mastoid process and the bordering bones receive their supply from the arteries of the dura mater and pericranium, internal and external. This process is penetrated by a number of vessels, which furnish the connexions between the veins of the soft covering of the skull, and the sinuses and veins internal to the calvarium. (Venæ diploicæ temporales posteriores, venæ emissariæ mastoidæ.)

In drawing blood from the mastoid process, we are able to cause a quick and full stream to flow, especially by means of Hourteloup's artificial leech, and to take blood not only from the periosteum, but also from the veins and sinuses on the interior of the skull. (The artificial leech is used a great deal in Germany, especially in Professor Graefe's Ophthalmic Hospital in Berlin, and with seeming excellent results. It may be obtained in New York.) This much then as to the position for local blood-letting according to the cases.

I have still to add a few rules for the application of leeches near the meatus. You should indicate the place of application with ink. If you do not close the auditory passage with cotton, blood will run in, which may coagulate there, and increase the malady of the patient; the leech itself may also get in. A colleague told me, that he once applied a leech to the ear, it crept in, and caused such excessive pain, that he thought it must have bitten the membrana tympani, and so it remained during an exceedingly troublesome hour. I think in such cases we could help the matter by dropping in a solution of salt. It is best, however, to prevent such an accident

by stopping up the auditory canal. Further, it is well to tell the patient the means of arresting the bleeding, for occasionally the hæmorrhage proceeds further than is wished, especially in the temporal and aural region. I know a case, in which a leech placed upon the temple, was the immediate cause of death in a child of two years of age, because those about were not able to check the hæmorrhage. After the bleeding has ceased, cover the bite with a piece of court plaster, or similar material. There are cases which react after every leech bite with erysipelatous swelling of the face and head. Whenever the wound easily becomes unclean, as for instance in otorrhœa, this is very apt to be the case. It is not long since that I saw, it on a patient for whom I had ordered a leech applied, extending from the place of application, over the whole face, and which assumed such proportions, that it was only by the most energetic means that I could restrain its progress. In this case I had every reason to suppose that the erysipelas arose from contact of an otorrhœal discharge with the wounds of the leech. "Little causes, great effects," is a sentence whose full import is yet to be comprehended in the practice of surgery. Do not consider little things too lightly, and you will very often guard against great injury.

LECTURE VI.

DIFFUSE INFLAMMATION OF THE AUDITORY CANAL, OR OTITIS EXTERNA.

Periostitis of the Auditory Canal, no Independent Process.—Different Causes for Otitis Externa.—Acute Form, with its Subjective and Objective Symptoms.—The Chronic Form.

GENTLEMEN—As we in our last lecture considered the circumscribed inflammation of the auditory canal, the follicular abscesses, or furuncle, we come naturally to-day to speak of the diffuse inflammation of the same part, or of Otitis externa.

I think I am sustained by clinical facts, in classing together the various forms of diffuse inflammation of the auditory canal, under the common name of otitis externa. In order to a better understanding of the nomenclature here adopted, allow me to say, that by Otitis *interna* I understand the purulent catarrh of the middle ear, or cavity of the tympanum. The simple mucous catarrh, I call simply aural catarrh. By otitis I understand all forms of inflammation, which cannot be confined in description to one particular part of the ear. (The author's nomenclature as here given, and as will be subsequently developed, is as follows in the order met with in his book:

1. Furuncles in the auditory canal, or circumscribed inflammation.
2. Otitis externa, or diffuse inflammation.
3. Myringitis, or inflammation of membrana tympani.
4. Aural catarrh, or mucous catarrh of the middle ear.
5. Otitis interna, or purulent catarrh of the middle ear.
6. Aural polypi.
7. Otitis, or general inflammation of the various parts of the ear.
8. Nervous Deafness).

Some authors, among whom are *Kramer* and *Rau*, distinguish between an inflammation of the cutis and periosteum. Definite observations, on a primary, isolated inflammation of the periosteum of the auditory canal, are not presented. The cases which are reported under this name, are long standing affections, in which nothing at all can be shown to indicate that the bone was the part first affected. On the contrary, we are often able to observe inflammations of the integument of the auditory canal, which afterwards produce affections of the bone lying under, and it seems to me much more probable that the periostisis is always a consequence, a follower of a severe and neglected inflammation of the cutis.

Not only do clinical observations lead to such a view, but the anatomical facts speak further on the subject. Cutis and periosteum are generally so intimately connected with each other in the bony portion of the canal, that the latter can scarcely be isolated, and is more easily separated from the cutis than the bone. In consequence of the close connexion of these two parts, every intense inflammation of the cutis also has its effect upon the periosteum, and may even produce inflammation, and subsequent caries. Many writers, among whom is *Toynbee*, speak of a catarrhal inflammation of the auditory canal. The integument is certainly always thinner and softer, the more it nears the membrana tympani, but this does not make it a mucous membrane, but a kind of middle material between mucous membrane and common integument, such as we everywhere see where these two tissues join each other. The name *catarrh*, according to common modes of speech, only pertains to affections of the mucous membrane, its use for inflammations of the external auditory canal is not proper, and the name Aural Catarrh should only be used for the middle ear, which is really covered with a mucous membrane. Itard speaks of a "Catarrhal otitis externa," and of a "Purulent otitis externa," both of which names are equally incorrect. The only distinctions we are able to make in the external auditory canal, are between an acute and chronic diffuse inflammation, or otitis externa.

Otitis externa is an uncommonly varied appearing, polymorphous affection. Sometimes occurring entirely unmasked, runs its course without any marked effect, either locally or

constitutionally, and disappears without treatment. Even so often it appears suddenly, and with very disturbing and annoying symptoms, which are not only felt in the ear, but place the whole organism in a febrile condition, often continuing a long time, then disappearing and returning, each time bringing with it a deeper affection, and making life a burden on account of the severe pain accompanying it, and often making the patient's existence doubtful. Each inflammation of the ear can reach such a point of danger, and it is certainly wrong that their presumptive unimportance should lead us to regard them lightly in the outset. We should never neglect the treatment of otitis externa, because after it a certain degree of deafness and purulent discharge almost always remains.

It is an affection which may appear in every time of life, by far more commonly, however, occurring in childhood and infancy.

Rau calls attention to the fact, that each new cutting of the teeth in some children is accompanied by irritation of the cutis.

The Causes are in the highest degree various. It may occur from acute and chronic exanthemata, which extend from the integument of the face to that of the ear. Thus measles, scarlet fever, and small-pox, not only attack the mucous membrane of the ear, first, but also the integument. The eczematous eruptions of the face which are so common, may extend themselves to the ear, or exist there independently and primarily. I have more than once observed in patients with constitutional syphilis a moist variety of condylomata appearing on the meatus auditorius, &c., and after this had occurred gradually a mild form of inflammation and purulent discharge from the auditory canal appeared. On the post-mortem of one patient suffering from pemphigus, I found that the skin disease had extended to the auditory canal, and to the membrana tympani. Otitis externa occurs quite as often from irritations, and injuries of various kinds working from without. Some ladies are in the habit of dropping Eau de Cologne in the ear for the relief of toothache, as recommended by Malgaigne, and by this means diffuse inflammation may be excited. I saw a case of inflammation arising from frequent and long continued injections of the ear.

Such an affection is very apt to arise, and that of the severest

form, after foreign bodies have been removed with an unnecessarily great degree of energy.

Cold upon the ear, as for instance a draught of air blowing upon the head, in the case of working near a broken window, or cold water being introduced, are frequent causes of otitis. Cold is not generally well borne by the ear, and we should protect it more than is generally done. (The traveller in Germany cannot fail to observe the great prevalence of the habit among the people of all classes of stuffing the ear with cotton, even in the mildest weather. I believe this is about as sensible a practice as stuffing the nostrils would be, the natural curvature of the auditory canal being protection enough from the open air. The cartilage of the ear will be frozen before the membrana tympani or canal will be inflamed by the contact of cold air, provided it does not reach it through a narrow aperture, as in the case of a broken window. Ladies generally cover their ears with their hair or bonnet, and the amount of deafness is just as great among them as with the other sex. I cannot but enter my protest against this practice of indiscriminately filling the auditory canal, which Dr. Tröltsch barely suggests, but which Kramer and others advise. I do not believe there is a case on record, where inflammation of the ear has resulted from leaving the meatus uncovered in an open cold air. If the body becomes chilled, or the feet wet, or a narrow draught of air blow directly upon the head, this inflammatory action may result, and thus cold becomes one of the causes of deafness.) All fluids to be placed in the ear should be previously warmed, lest they excite unpleasant, if not positively injurious effects.

So insidious is the affection sometimes that we cannot find any visible appearance of it. Such cases occur very often in children, as well in those who are healthy, and those who are inclined to glandular affections, eruptions on the skin, and are denominated scrofulous. I cannot warn you enough, gentlemen, from the too frequent use of the diagnosis "scrofulous." It is among too many, a convenient expedient to get rid of aural examination of the affected portion, and of a tedious and wearisome local treatment. The diagnosis *scrofulous* plays a great part in diseases of the ear, and a fatal one, and yet the chief foundation for this opinion, enlarged cervical glands are often only consequences of neglected discharges from the

ear. If this be treated, the enlarged glands disappear. We find catarrh of the cavity of the tympanum as a complication of otitis externa very often in children, just as very often in children affections of the skin and mucous membrane often occur together. The causes which produce this disease are very many, so that the friends of classification and sub-classification may have there a great list of them. Thus they may classify them according to the degree of the affection, and the severeness of them, as erythematous, erysipelatous, and phlegmonous; according to the ascertained constitutional affection, morbillous, scarlatinous, or variolous, as scrofulous or syphilitic, as rheumatic or traumatic, etc., etc.

All these various forms do occur, and it cannot be denied that the course of it may be very much modified by the cause. For practical purposes, however, such qualifications are of no use to us, and you should not plague yourselves with their memory.

The symptoms and course of otitis externa, as we see from the foregoing, are various, according to the producing causes, their variety and intensity.

In the acute form of otitis externa, the patients generally complain of an itching, with a feeling of heat and dryness in the ear, and the itching or tickling sensation is so great in some, that they are scarcely able to refrain from placing some kind of instrument, as an earspoon, or the like, into the ear. The cessation of this symptom is followed by pain; a dull heavy pain, rising to a severe beating, which is felt deep in the ear, almost always occurring in the night, and with loss of sleep, feverishness, it goes on easily to delirium. Pains declaring themselves in the deeper parts of the ear, extend themselves in severe cases to the whole side of the head. They are increased by every motion of the body, still more of the head, as in sneezing or coughing; by any motion of the jaw, as in chewing and yawning. The latter named symptoms occur more particularly when the anterior portion of the ear is affected, and the cartilaginous portion takes part in the swelling. In trivial cases, the anterior region is not much swollen, but very tender on pressure. The vigorous moving of the canal, as for instance in straightening it for examination, causes pain, and the ear speculum should be introduced

very carefully and slowly. The hearing power is affected according as the membrana tympani takes part in the inflammation, and this is always more or less involved. If we examine the ear in the beginning of the attack, we find the epidermis with the surface of the drum greatly injected, and swollen. The injection and hyperæmia show themselves more clearly on the membrana tympani, and the adjoining parts, because, in the outer portion of the canal, the congestion is concealed by the thicker surface of epidermis.

After the congestive stage has lasted seldom longer than two or three days, an exudation appears. In the beginning this is of a white color, watery in consistence; a little later on it becomes a kind of mucous secretion, and at last yellow pus. Coincident with the appearance of this otorrhœa, which in the beginning is slight, but which is always increasing, the patient feels a great improvement and the pain suddenly disappears. In some cases this otorrhœa is not so much a formation of cells, as a very rich desquamation, so that in a short time the whole auditory canal is filled with a white, moist, as it were, macerated lamella, which I have seen more often on the drum itself, than other parts. We can, by injections or by means of delicate forceps, remove a number of white flakes of the size and form of the membrana tympani, which are certainly furnished by its outer surface; some are also the shape of the walls of the canal. I have mostly observed such desquamations in cases where the pain was very severe and extended, for the reason that the pain and importance of the affection is the greater, the more the membrana tympani and deeper parts are involved. If we make an examination later, or during the exudative stage, the canal must be previously cleared by injections or pencillings. If the injection tube be very large, and the stream very strong, it is easy to perforate the membrana tympani. On account of the great amount of swelling and infiltration, it is difficult to appreciate the condition of the different parts of the canal, especially the deeper ones, their appearance and relative position being greatly changed. The examination is also often made more difficult, on account of the amount of the secretion adhering to the wall, and on account of the saturated scales of epidermis, which are in the light, and which can only be slowly

removed. If, however, in spite of the hindrances, we succeed in getting a good view, we see the walls of the canal appear saturated and swollen, more or less denuded; and when the latter is the case, the membrana tympani presents an equally red surface, in which no single vessels can be distinguished resembling a granulating wound, or a blennorrhagic conjunctiva.

Often in these cases, where the desquamating process has taken place, there are small spots covered with isolated bits of epidermis, or with a thin layer of pus, which if removed appears again, almost before our very eyes. Afterwards, the otorrhœa appears, which stage is generally blessed by both physician and patient, because the pain generally ceases. This otorrhœa may continue a long time, or it may, under very favorable circumstances, and without treatment, gradually and entirely disappear.

Much more often, however, it becomes chronic, and when nothing is done for it, lasts for years, in various and variable degrees of intensity, and may continue with some insignificant interruptions throughout the entire life. A great number of otorrhœa cases coming under treatment, may be referred back to such a starting point. Very often, however, patients presenting themselves with otitis externa, do not speak of such a painful origin; it has had a much more insidious character. Such a chronic form of disease is quite as common as the acute form, and arises without marked symptoms, occurring as often as that springing from neglect of the acute.

The subjective symptoms are very evident. The nose will call attention to the affection.

The painful symptoms sometimes recur, even when the trouble has existed for a long time, with no more disturbance than a discharge from the ear, and some hardness of hearing. Sometimes the otorrhœa only appears periodically in moist summer weather. In this form we find the canal only a little swollen, its covering softened, as if macerated, injected, and covered with a secretion—brown, offensive smelling crusts. The general redness is only to be observed in the deeper parts, and on the membrana tympani. This seems flattened, its cutis thickened, and it is richest in this over the malleus, which is scarcely to be seen. The amount of the secretion is very various, changing according to the time of year, and the

other influences; at one time the meatus is almost dry; again, there is a profuse discharge, which excoriates the skin of the ear and neighboring parts, and soils the clothes of the patient.

I have never been able to measure the exact amount of the discharge, but I have seen cases where it was at least from three to four ounces daily. Such cases of profuse secretion, we find generally in the case of children of the peasantry, who are not always kept clean, who even advocate the continuance of the filthiness, by saying that the disease must be cured by constitutional remedies (von innen heraus), and not by "driving it in," which causes dangerous internal diseases to arise. These children, who, except as to the ear, are specimens of freshness and health, are treated for months and years with iodide of mercury, Plummer's pill, laxatives, etc., all sour and fat food, even fruit, forbidden them; and as if the region of the ear were not irritated enough, it is made so by means of tartar emetic ointment, and other vesicants. In short, all the remedies on earth will be brought to cure the discharge of the ear, without thinking of the first surgical as well as domestic law, *cleanliness.*

LECTURE VII.

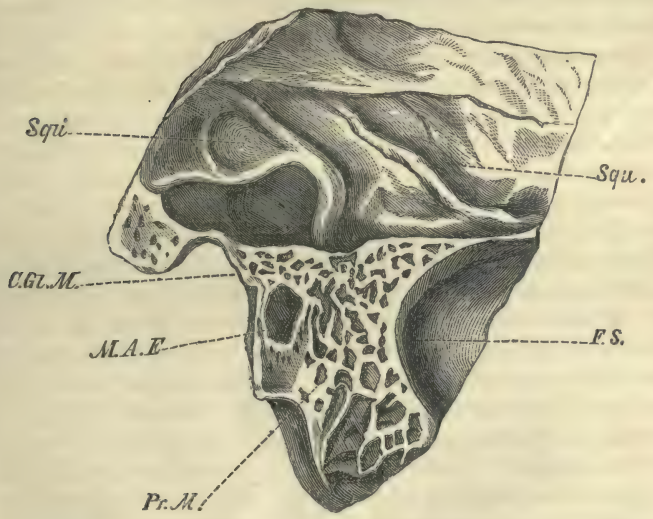
OTITIS EXTERNA (CONTINUED), NARROWING OF THE AUDITORY PASSAGE, OR MEATUS AUDITORIUS EXTERNUS.

Consequences of the Affection, Prognosis, Treatment, Vesicants, Cataplasms, and Drops for the Ear to be avoided.—Slit and Circular Narrowing of the Canal, Exostoses and Hyperostoses.

GENTLEMEN—In the course of long standing otorrhœa, polypous growths are very apt to be formed, which tend to an increase of the secretion of the ear, and often mingle blood with it. A number of other pathological changes may arise, inasmuch as the pus, which remains in the canal for a long time, decomposes and irritates the tissues, and brings them into an inflammatory condition. The membrana tympani very often ulcerates; and the morbid tissue, till now confined to the outer portions, extends to the cavity of the tympanum, and the inner part of the ear. We will later give a more careful and connected notice of the subject of discharges on account of its great importance. Here, however, I only call your attention to the fact, that not only purulent processes of the inner and middle ear, but also those which are confined to the outer ear, can produce those unpleasant consequences so well known to you as resulting from otorrhœa. I have to call to your attention the neighboring, relative relation between cutis and periosteum, of which we have just spoken, and to bring to your mind more exactly the situation of this canal. As you know, the upper wall of the bony portion of the auditory canal forms also a part of the floor of the cerebral cavity, and that this bony wall is always slight, porous in structure. Sometimes the upper wall is thinned even to translucency, so that there is only a thin layer of bone between epidermis and dura mater. Posteriorly the auditory canal is

separated from the fossa sigmoidea, in which the greatest blood-vessel of the dura mater lies, the sinus transversus, even in adults, by a layer of bone only a few lines in thickness, which only presents on each surface a small quantity of compact tissue, in other parts is made up of cellular structure, such as obtains in the mastoid process. It must be evident that the adjacence of such diploetic bodies to the sinus transversus and the brain, can produce very important results

From Tröltsch's "Anatomy of the Ear."



Vertical section of the bony auditory canal (right side), made near the membrana tympani, and almost parallel with it.

M. A. E.—Meatus auditorius externus.

C. Gl. M.—Articulation inferior maxilla.

Sq.—Inner surface of squamous portion of temporal bone.

The dura mater has been removed, we see the elevations and depressions of the inner surface of bone.

P. M.—Mastoid process.

F. S.—Fossa sigmoidea, in which the sinus transversus runs.

in the course of inflammatory and purulent processes in the auditory canal, and that such affections, with and without participation therein of the cavity of the tympanum, without per-

foration of the membrana tympani, without caries of the ossicula auditûs, may be very dangerous to life in their results. *Toynbee* speaks of such a case of inflammation of the auditory canal, which, with no perforation of the drum, or ulceration of the bones, went on to meningitis purulenta.

In two cases in which I made post-mortem sections, accompanied of course by other changes in the deeper parts of the canal, there were fistulous passages leading from the posterior wall of the auditory canal, through the mastoid process to the sigmoid fossa; and in the one case, where there was a developed thrombus in the transverse sinus, the destruction of the thrombus began when the bony fistula opened.

These anatomical considerations are doubly worthy of notice in children, when the bony wall of partition from the brain is very thin and porous, and when there are plentiful openings for blood-vessels, which lose themselves in the bone substance, and communicating with branches coming from the dura mater. Now the purulent discharges from the ear are very common in childhood, and are paid very little attention to by physicians and surgeons, when occurring in young children, but left to themselves unless some especial symptoms call attention to it. Even so little is this cellular space, as well as the blood-vessels of the brain in such contiguity to the ear, observed in post-mortem examinations, and it may sometimes have occurred that the true cause is overlooked, which under form of meningitis, pleuro-pneumonia, typhoid or pyœmic condition, led to a fatal result. Never then omit in the diseases of children, when the importance of the symptoms is so uncertain and doubtful, to look by the sick-bed, and on the post-mortem table, at the possibility of the origin of the trouble in the ear.

The *Prognosis* of Otitis Externa necessarily varies according to the exciting causes. An idiopathic inflammation of the auditory canal, or one produced by no extraordinary means, allows a favorable prognosis, if the disease be comprehended and appropriately treated. The secondary form, occurring in the Exanthemata, often results badly, because, in the danger of the constitutional disease, which may be great, threatening life, the ear trouble is either not carefully observed or entirely overlooked.

The more the membrana tympani is attacked with the in-

flammatory process—and this is often the case in the acute Exanthemata, and there is an acute inflammation of the cavity of the Tympanum—the less shall we be able to avoid a perforation of the membrana tympani. However, when other circumstances are favorable, this perforation is not so extremely serious, and can always be remedied by a new formation. The Prognosis is much more unfavorable if the process has existed for some time, and important changes have already occurred, in other words, in chronic Otitis Externa. As is seen from our remarks, each Otorrhœa must be considered, viewed by itself, as a serious matter, with certainty dangerous to the ear; for we cannot be certain as to how much part the adjacent parts, viz. the bones of the ear, will take in the process; and the prognosis in every chronic Otorrhœa will be considered uncertain and doubtful, although the form which is confined to the external ear is generally healed, the discharge gradually ceases, and the hearing returns to a certain degree.

The Treatment of Otitis Externa in the beginning of the acute form, as well as in each subacute branch of the chronic form, is an unmistakably antiphlogistic one. The patient should remain in-doors, be placed on light diet, and take a saline cathartic. Leeches are almost always required, and those, according to our previous advice, should be placed before and on the external meatus. As a rule, from two to four will be enough; and occasionally their application will require to be repeated, if the pain and other inflammatory symptoms continue. Next to leeches, nothing so quiets the pain as often filling the ear with lukewarm water, leaving it in the ear, the patient lying on the other side from five to ten minutes. If purulent discharge has commenced—Otorrhœa—we must before all things secure the removal of the secretion; and to this end the ear should be syringed three or four times daily, which performance is generally extremely pleasant to the patient, if the temperature of the water be properly regulated, and the injection be done slowly. In the intervening time the patient should lie on the affected side as much as possible, in order that the secretion may have a free exit; and this may be assisted by long strips of thin lint or linen placed in the ear. This last suggested appliance is a good one to be used in all cases of discharge from the ear. For the diminishing of

the secretion you may use astringent lotions, weak solutions of alum, acetate of lead, sulphate of copper or zinc, with which you fill the canal, after it has been cleaned. The same solutions, gradually increased in strength, should be used in the chronic form of the disease, and should be retained as long as possible in the ear. These should be always warmed, never cold ; when dropped in, a small reagent-glass may be used for warming the lotion. When there is only a slight amount of discharge, we may remove it by means of a camel's hair pencil.

Shall we consider, now, the remedies which I do not use or recommend in this affection. First, then, there are Blisters and pustule-causing Salves, which are applied by aurists indiscriminately over the mastoid process. In acute inflammation they increase the pain and irritation ; and in children and persons with a delicate skin, produce an Eczema in the region of the ear. In chronic cases, however, they will seldom do harm, but no manner of good. We have had full opportunity to collect experience on this point, since almost every patient with chronic affection of the ear has been blistered. Who can deny that in a case of Otorrhœa, a long continued discharge behind the ear is a real source of trouble and of uncleanness? Dry heat, applied by means of warm cloths, or warmed cotton, as is commonly used in Germany, in stilling pain in the ear, diminishes somewhat the pain ; but it returns in a greater degree so soon as you discontinue its use, and in this way the inflammatory condition is considerably increased. The moist applications, such as poultices, are common among aurists. I have made use of them in my former practice, but have now nearly discontinued the habit, only making use of Cataplasms in the case of Furuncles, or *entirely superficial* diffuse inflammation of the canal. Nothing stills the severest pain in the ear so quickly, and exerts such quieting influence ; no remedy shortens the painful congestive stage as the application of poultices, in the various forms of Otitis ; since it quickly produces exudation and discharge, and with it cessation of tension and pain. There can be no question as to the truth of this experience.

In spite of all this, I warn you against their use in all deep-seated inflammatory processes in the ear, because there is

nothing so adapted to produce profuse and wearying discharges as poultices.

When I compare the results of my present practice with my former, when I commonly used poultices, I perceive a very marked difference in that now a perforation of the membrana tympani seldom occurs, and the following discharges show themselves much less obstinate. This is a fact well worthy of notice in all inflammations, where the membrana tympani is affected in any way; and I am of the opinion that the number of cases of otorrhœa and affections of the temporal bone would be sensibly diminished, if all inflammations of the ear were not so indiscriminately treated by the application of cataplasms.

The often filling the ear with warm water, which is a clean and interrupted cataplasm, will greatly diminish the pain, if not quite as much as the application of a poultice to the whole region of the ear; and from it I have never seen any such excessive softening and relaxation of tissues, such as followed from the generally practised method.

If we refer to the analogous condition of affections of the eye, for a proper estimation of this practically important question, we know that in blennorrhœa of the conjunctiva, the warm treatment produces very quickly destruction of tissue, and we can excite an intense form of blennorrhœa, by the use of cataplasms; for instance, in an old case of pannus, warm poultices produce almost the same effect as inoculation with blennorrhagic secretion.

Finally, as to the dropping in of warm oil, which is practised by some aurists. It has no kind of advantage over the dropping in of warm water; on the contrary, the positive disadvantage, that oil is a kind of foreign body, an adhesive substance, which is not fitted to bring into contact with an irritated surface. Glycerine is better, not being adherent, and is soluble in water, so that it can be removed by syringing. However, simple water does the best service.

Before we leave the external auditory canal, we have still to consider a number of circumstances, which may leave different degrees and different kinds of contraction, or narrowing of the external auditory canal. The most common is the slit-shaped narrowing of the cartilaginous portion. Here at the entrance

of the canal, the anterior and posterior walls may lie close together, and lose the oval lumen, becoming simply a fissure or slit, or may even fully disappear. I have only observed this form in the case of old people. In one very marked case which I observed during the lifetime of the patient, and also after death, in a section of the parts, the dense fibrous tissue which forms the upper and posterior portion of the auditory canal, was in a condition of extreme flaccidity, and sank towards the anterior wall. It appears to me, that such a flaccid condition of the fibrous tissue is the principal reason for this narrowing of the canal. It is a quite frequent condition, and often goes on to an entire closure of the passage, and a consequent diminution of the sharpness of hearing. The normal removal of the cerumen is rendered difficult by this change; and an accumulation easily takes place, which is especially apt to happen in old persons. Persons whose hearing is impaired from such a cause, will hear better, as soon as the cartilage is pulled back or a speculum introduced.

The wearing of such a formed cylinder in the ear, one which the patient can himself introduce, will be of service.

Such forms of senile deafness, of a high degree, are however rare. I have seen but two others which pushed the anterior wall backwards, produce the same result. The view of *Larrey*, the father, that the loss of the molar teeth and the thereby changed position of the under jaw, caused the cartilaginous walls to fall together, is manifestly incorrect.

A ring-shaped narrowing of the auditory canal occurs occasionally in consequence of a thickening of the skin, with or without otorrhœa. In one case it seemed to be the result of repeated furuncles, which appeared only in one ear. It is most commonly produced by chronic eczema, which sometimes so thickens the integument as to fully close the canal. This condition is best treated by the ordinary astringent applications for eczema; astringent lotions, ointment of zinc, or red oxyde of mercury. In one case, the thickening was so great, that the auditory canal could scarcely be entered with a thin sound. Compressed and graduated sponge gradually widened it, so that the parts could be examined with a speculum, and the chronic otorrhœa interna could be treated from without.

Three forms of narrowing occur in the bony portion of the canal. The one most common, but never very extensive, consists of an abnormal lying inwards of the anterior wall, close on to the membrana tympani. It occurs in every time of life.

When this condition of the auditory canal is present, we are not able to see the most anterior and lowest portion of the membrana tympani, even by pulling the auricle very far back, and this hindrance to a full view of the membrana tympani, so far as I know, is the only influence which is exerted by this deviation from the normal condition of the canal.

Exostoses of the auditory canal occur much more rarely, round hard elevations varying in size, which are either covered with white, or red, and thickened integument. I have always found them on both sides, generally more in one canal than the other, seldom on the anterior wall, or adjacent to the membrana tympani; still I have observed no case in which they impaired the efficiency of the canal. *Toynbee* describes a number of such cases as existing on the anterior wall, and in some cases there was appreciable narrowing of the canal on their account. He considers their presence as evidence of a rheumatic or gouty diathesis. In all my observations, the cases occurred in men who were free livers, without, however, any arthritic symptoms; and I have seen these little elevations at the beginning of the bony part of the canal, only as accidental coincidences in declared catarrh of the cavity of the tympanum. The contact with the sound developed great sensitiveness. *Wilde* observed one case of almost complete closure of the auditory canal, by means of an exostosis, which had its origin in the posterior wall. There were also two small exostoses in the other auditory passage.

As there were evidences of progressive inflammation, he applied leeches to the meatus, and gave small doses of bichloride of mercury internally, by which treatment they were diminished in size, and the hearing perceptibly improved.

Toynbee observed a decrease in size in one case, after the use of a solution of nitrate of silver, and recommends the use of iodine internally and externally in such cases.

Hyperostoses of the auditory canal are similar in their

symptoms to the exostoses. These remain often after chronic otorrhœa, or spring up after this affection. In these cases, we have generally to deal with an all-sided, uneven narrowing of the auditory canal. The integument is generally found in a reddened condition in these cases.

LECTURE VIII.

INFLAMMATION AND INJURIES OF THE MEMBRANA TYMPANI.

Affections of the Membrana Tympani very common, but seldom occurring alone and uncomplicated.—Acute and Chronic Myringitis, Lacerations and Perforations of the Membrana.—Several Cases of Fracture of the Handle of the Malleus.

GENTLEMEN—Affections of the membrana tympani occur very frequently, and this we would infer from its position and anatomical relations. It forms the partition wall between the auditory canal and cavity of the tympanum; it can therefore be considered as belonging to both parts, and takes part in the affections of each of them. Moreover, tissue from either side is extended upon its surface, on the outer side from the auditory skin, a covering of skin and epidermis, and on the inner a continuation of the mucous membrane of the cavity of the tympanum, or middle ear; all the vessels and nerves of the membrane run in these two surfaces, while the middle layer has neither. This gives an additional reason, why the membrane should participate in the affections of the adjoining parts. We remember also that three of the most important tissues of the animal system are found in this membrane—the skin, mucous membrane, and fibrous tissue, hence pathological changes are very common in the part, and they seldom occur alone; the membrane receiving, as we have seen, its blood and nerve supply from the adjoining parts, it is scarcely possible that it should be affected alone. It receives the inflammatory process from them, and in turn when it is first attacked communicates it. In chronic cases, we are almost unable to tell which was the part first affected, the membrane or cavity of the tympanum.

I do not agree with the most authors, when I deem the exist-

ence of a true uncomplicated inflammation of the membrana tympani to be rare. I am constrained to this view, however, from the observation of a considerable number of patients; made, as far as I am able, in an impartial manner. The anatomical description of the parts involved, as well as the history of the cases in the text books, when they are carefully examined, also sustain this view. These present the symptoms of a diffuse inflammation of the auditory canal, or an acute or purulent catarrh of the cavity of the tympanum, in either of which processes it is easy to see that the drum of the ear will readily enough be involved. As a rule, we may by no means believe from the descriptions, that the membrana tympani was first and alone attacked.

Myringitis* may occur in an acute and chronic form. The acute form, in the cases which I have observed, always occurred suddenly and in the night, generally after exposure to cold, and it could be generally traced to its cause; often after cold bathing, and accompanied by severe pain, increased by laying the affected ear on the pillow, and accompanied by a feeling of fulness, insensibility, and heaviness, and almost with a very great roaring sound in the ear.

These symptoms, with infrequent interruptions, last from twelve hours to three days, and cease so soon as the auditory canal becomes moist, and a gradually developed discharge from the ear begins. In one case the pain ceased after a sudden attack of hæmorrhage from the ear, which, according to the patient's account, was to the extent of a table-spoonful of blood.

Objective Symptoms.—In the beginning of hyperæmia of the membrana tympani, it appears as if it were artificially injected. There are not only three large vessels running along the handle of the malleus from above to the central most concave portion of the membrana tympani, called the *umbo*, and radiating from this point, but there are also vessels on the periphery, running to the centre, and connected on all sides with vessels of the canal. As a consequence of the infiltration of the epidermis, the shining appearance of the membrana tympani is soon lost, and its external surface becomes dull like glass that has been breathed upon.

* So named by Linke and Wilde.

The handle of the malleus, which in a normal condition may be seen as a yellowish white stripe in the middle of the membrana tympani, is not to be seen at the same time, the membrane appears more flattered. In later stages the epidermis is lifted up in little lumps or lamellæ; and the corium, or true skin, is red, swollen, and loosened, and covered with a thin secretion. The auditory canal, which in the beginning of the attack remains entirely normal in the neighborhood of the drum, becomes injected very quickly. In some cases which I observed, the process went on to ulceration, and perforation of the membrana tympani. In one case to a kind of subcutaneous ecchymosis. In another I observed on the posterior and upper edge of the membrana tympani, a swelling about as large as a pea, yellow, soft, and tender, touching which with the sound caused severe pain. The little elevation in the membrana tympani, protruding its surface into the auditory passage, I regarded as an abscess formed between its layers. This decreases gradually with the subsidence of the inflammatory process. Under favorable circumstances the generally slight amount of discharge from the ear gradually ceases, the redness and infiltration disappear, and it is again covered with epidermis. It always, however, remains for some time dull and flat in appearance. The handle of the malleus, so distinctly to be seen in a normal condition, is not now so distinct in consequence of the thickness of the layer of cutis; consequently we are able to verify an infiltration into the membrane long after its occurrence. I have observed these cases as only occurring in one ear. *Chronic inflammation of the membrana tympani* is observed more commonly than the acute. It is of a mild form, with very little formation of pus. Severe cases are always complicated with inflammation of the external auditory canal, so that we have to deal with a case of otitis externa, or it is extended with ulceration and perforation of the membrana tympani to the middle ear. Single uncomplicated chronic inflammation of the membrana tympani develops itself with so few subjective symptoms, that the patient first becomes aware of it in a marked dulness of hearing. The pain is generally so slight and transient, and the affection is so little disturbing, that it may exist for years before any medical aid is sought.

In examining the external auditory passage we find no changes, except a partial softening of the epithelial covering in the immediate neighborhood of the membrana tympani in consequence of the adhesion of secretion. The secretion is generally small in quantity, quite consistent, with an offensive smell; it covers the membrana tympani, and is always on the adjacent parts in the form of crusts. The drum, even when there is no secretion from it, always appears dull and hazy, so that we can only just make out the handle of the malleus, and its processus brevis; the epidermis, but only in certain points, generally posteriorly and above, is removed, and the spots are red and swollen. The remainder of the tissues appear variously yellow or grey in color, occasionally thin, and varicose veins running through, which are generally found on the periphery. Polypi may be developed from these small swellings, spoken of above, and the purulent discharge is often only from these.

The *prognosis* in the acute form is very good, if the patient be properly treated. The purulent discharge soon ceases, and the pain does not return. Recent perforations heal quite readily, when there is no purulent catarrh of the middle ear connected with it. The thickening of the membrane gradually disappears, and the hearing is restored. Under favorable circumstances scarcely a vestige of the disease remains. On the other hand, if the disease be neglected, if it be treated with poultices, or with irritating drops for the ear, the membrana tympani will remain perforated, and the otorrhœa easily become chronic, the purulent inflammation will extend itself more and more on all the other parts, and all the consequences of a chronic otitis can develop themselves from a simple myringitis. We shall see further on, what an importance chronic otitis has for health and life.

In chronic myringitis the prognosis is much less favorable, for it is only by a year-long treatment that we are able to restrain the secretion, and even then there will exist a certain tendency to relapse. Furthermore, the pathological changes, especially the thickening of the membrana tympani, are generally so great, as not to lead us to expect much from the improvement to the hearing.

Treatment.—A very great deal here is identical with that of

otitis externa. In acute myringitis in connection with local blood-letting, you will give cathartic doses of calomel and jalap. Poultices are especially not to be employed here, but warm water slowly and carefully poured into the ear, according as there is pain felt in the part. If exudation has occurred, you should daily cleanse the ear by careful syringing, and afterwards drop in a mild astringent, and of these I give the preference to acetate of lead. In cases of long duration of the treatment, when the discharge becomes chronic, the remedies will be often varied. Vegetable astringents do not appear to me as efficacious as mineral. Under this treatment the purulent discharge will cease, and a quite extensive perforation will heal. For the remaining thickening of the membrana tympani, tr. iodine or an iodurated salve should be rubbed behind the ear. If there is no purulent discharge present, and there has been none for some time, we can use stronger vesicants—nitric acid, croton oil, which in the beginning should be dilute, and gradually increased in strength. I have sometimes seen good results in superficial thickening of the membrana tympani from strong solutions of bichloride of mercury, from one to four grains to the ounce. The pain of such an application is sometimes very severe, and we must be very careful that none of the fluid be collected together on the anterior and lower portion of the membrana tympani, where it would readily perforate it, and you must never undertake such a treatment when you do not always have the patient under your eye. (The counter-irritation may be continued for months, and a constitutional treatment, the administration of mercury in some alterative form, given to the extent of just touching the gums, and then followed by iodide of potassium. The German aural practice, although I believe, on the whole, the best, is very much inclined to lightly esteem constitutional treatment in diseases of the ear. Kramer goes to a great extent in his ideas as to the entirely local character of the diseases of the ear, and scouts the idea of any alterative treatment. Some diseases of the ear require constitutional treatment, and among them chronic myringitis, just as certainly as iritis. It often depends on a syphilitic diathesis, and notwithstanding late and fashionable teachings, I believe that the power of mercury will again be universally acknowledged.) We have now to speak of injuries

to the membrana tympani; these are quite common, as we would infer from its delicacy of structure, and its susceptible position for external impressions. These injuries are generally ruptures, occurring from blows, a box on the ear, etc., or from explosions. I have seen old and recent rupture of the membrana tympani, the latter accompanied by otorrhœa, which were owing to a box on the ear, received at school. A short time ago a student presented himself to me, who had received a slap on the ear in a joke, and since which he had felt a slight pain in the ear. No discharge had occurred. The membrana tympani showed a rupture parallel with the handle of the malleus, running its whole length. The edges of the wound were reddened, and covered with blood. The posterior half severely injected, the anterior normal, hearing considerably diminished.

It has been denied, but improperly, that rupture of the membrana tympani may occur from the explosion of cannon. I have seen one recent case, and several old ones, which without doubt were thus caused, and when linear perforations or cicatrices were to be seen. The course of these is almost posterior to, and parallel with the handle of the malleus. Such cicatrices appear as greyish white, sometimes slightly bronzed lines.

Very many cases of deafness occur among artillerists who have served a very long time, and they always date it to a moment, when standing near a cannon in the act of discharging, they felt a heavy blow and pain in the ear towards the cannon, and blood escaped from the ear. In some cases I found the hardness of hearing so great, as to imply that still more serious injuries had taken place. It is well known that rupture of the membrana tympani often occurs in fracture of the base of the skull. *Wilds* relates two cases of suicide by hanging, when the membrane was ruptured. This is not always true, however; for I once made a section in a case of this kind, where the membrana tympani was uninjured. The membrane is sometimes perforated by means of sharp-pointed instruments, which are pushed into the ear, in order to relieve irritation or itching. Women often use knitting needles for this purpose, and I have seen cases which were brought about in this manner. A careless probing of the ear by the surgeon

may also produce the same result. It must be evident to you, that you should not put a probe into the ear deeper than you can illuminate it, and thus have the eye for a guide; without such a precaution, much injury may be done with the probe, or an instrument of similar character, where the surgeon endeavors to satisfy himself as to the condition of things without ocular inspection.

In cases of injuries in explosions, such as occur in artillerists, severer injuries, hæmorrhages, and lacerations of the deeper parts occur. These require careful observation, and treatment according to general therapeutic principles. We will speak of this again when we come to nervous deafness. To this place belong the few observed cases of fracture of the handle of the malleus. Meniere* speaks of such a case occurring in a gardener, who accidentally had a twig of a pear tree thrust in his ear. A very extensive laceration of the membrana tympani took place, and the little bones of the ear could be plainly seen and their movements distinguished. This remarkable injury healed of itself, without any especial treatment. I myself saw a case of united fracture of the manubrium mallei.

A wine merchant thrust a pen handle, which he held in his hand, into his ear, in consequence of knocking his elbow against an open door. The severe pain caused him to faint, and he did not recover for some minutes. Cold water was immediately put in the ear, and he could not tell whether blood flowed from it or not. After that time he heard poorly from the injured ear, and suffered from noises in it, more especially if he lay on that side. When I saw the case, one year later, the peculiar slanting position of the handle of the malleus was very striking, it appearing, also, uncommonly thick and prominent at a point immediately under the processus brevis, and from this point out turned on its axis. In short, it made the appearance of a united fracture of the handle of the malleus. *Hyrtl*† described such a case, which he found in the ear of a prairie dog (*arctomys ludovicianus*), which had a very similar appearance, and was also, as in the above case, immediately under the neck of the malleus.

* Gazette Medicale de Paris, 1856, No. 50.

† Wiener Medicinischer Wochenschrift, No. 11, 1862.

He decided that such an injury was not impossible to this animal, which is a relative to our marmot, lives in caves or holes under the ground, and whose membrana tympani, in consequence of the shortness of the auditory canal, is very external. (Professor Joseph Hyrtl, teacher of anatomy in the Vienna University, has a very extensive collection of the little bones of hearing, and of the internal ear, of the mammalia. He received a medal at the last London Exhibition; but his works and lectures have done more than can any medals to give him the great reputation which he so deservedly bears.)

LECTURE IX.

THE APPLICATION OF THE CATHETER TO THE EUSTACHIAN TUBE.

The History of the Subject.—Common Errors in the Use of the Catheter.—Method of Introduction.—Accidents which may occur.—Spasms of the Œsophagus.—Emphyzema.—Hæmorrhages.—Description of the Catheter.

Gentlemen—Now that we have finished the subject of the affections of the external ear and of the membrana tympani, we may turn to-day to those of the middle ear. These may be comprised in the cavity of the tympanum, the Eustachian canal or trumpet, and the mastoid process. In order to know the condition of these parts, deeply lying as they are, we must have some means of approaching them, and this we have in the Eustachian catheter, introduced from the entrance of the opening into the pharyrx. The mode of introduction of this instrument, and its use in practice, will be the subject of the present and the following lecture. It was more than a century and a half after the discovery of the connexion of the ear with the throat, by Bartholomeo Eustachio, in 1563, that any practical result of the discovery was had. It is a well known fact that it was a layman who first made use of the discovery—Guyot, the postmaster at Versailles, who, in 1725, promulgated to the Paris Academy the idea of injecting the middle ear, by means of a curved metal catheter, which he introduced through the mouth. He is said to have been cured of a deafness by this operation, which had continued for some time. Archibald Cleland, an English army surgeon, in 1741, without as it seems knowing anything of Guyot, proposed the introduction of the catheter through the nose, and this method is the only one which is practicable, and which is now used.

Whosoever expects to practise aural surgery, must be able to use this instrument, as we can by no means find a substitute

for it, or dispense with it altogether. You will find a general conviction among surgeons, that the introduction of the Eustachian catheter is a very difficult and painful operation. You, yourselves, however, have seen that such is not the case, and that it is only true in exceptional and rare cases. On the contrary, this operation is an easy and painless one, if we but understand the anatomy of the parts, and the method of performing it, dependent upon this, and practice will soon overcome all the little difficulties in the way of an easy introduction of the catheter. I use a silver catheter, bulbous-shaped at its curved end, with a ring in the straight extremity. This latter, by its position, gives evidence as to the exact situation of the point of the instrument. We must always, during the introduction of the instrument, keep a finger upon the ring, in order that the direction of the beak may be clear to us. The oiling of the instrument before introduction seems to me unnecessary. It is well to cause the patient to blow his nose before the operation, in order that slight temporary obstructions may be removed, and the canal somewhat moistened. I show you all the steps of the operation, by means of a half head. (Picture of instrument, page 90.) We introduce the bulbous-shaped, curved extremity of the catheter, with the point directed a little downward, into the inferior meatus of the nose, then quickly raise the whole instrument, so that the ring shall be exactly on a vertical line, pushing carefully further in, on the floor of the nasal cavity, till the posterior wall of the pharynx be reached, touching the atlas. Then draw the catheter from $\frac{1}{2}$ to $\frac{3}{4}$ inch backwards, towards yourself, lift the outer end somewhat, and turn the ring, which has hitherto been on a vertical line, to one running upwards and outwards or opposite to the external ear. In some rare cases, the ring can only be made horizontal. It is well to support the head of the patient during the operation, and that both surgeon and patient stand during it. The above described method is the one given by Kramer, and is undoubtedly the best. It has been advised not to pass the instrument as far back as the wall of the pharynx, but to attempt to turn the point of the instrument into the mouth of the canal, which is situated somewhat anterior. This method would seem shorter and more convenient, because we are not obliged to

pass over the same way twice, but it is not so safe, while we cannot generally tell the instant when the instrument leaves the nasal cavity and enters the mouth; it is much easier to feel one's way as above described, by passing the instrument fully back to the posterior wall, and then repass a portion of the route. The most common mistake in the introduction of the instrument is not withdrawing it far enough, thus causing the point to fall into the little fossa behind the mouth of the Eustachian tube. We may also, by a half conscious motion backwards, in turning the instrument, push it into this fossa. This mistake is the less remarked in that the light motion of the catheter in this position gives about the same sensation as when it is in the mouth of the canal itself. If we blow through the catheter, when it is in this position, it is felt, not in the ear, but in the neck, and we hear a moist, fluttering sound, as when mucus is set in motion. *Benjamin Bell*, the distinguished Edinburgh surgeon, says that when surgeons claim to have entered the entrance of the Eustachian canal, they have only entered this fossa. This statement proves nothing more than that great men sometimes make great mistakes. It is true that this error of lodging the instrument in this fossa is a mistake often made, especially by those who have had little experience with the catheter. This is explained from the fact that there is no rule, as to just how far we shall withdraw the point of the instrument, after having reached the posterior wall of the pharynx, since the distance of the mouth of the tube from the vertebræ is different in different individuals. After some practice, however, this is no longer difficult. The introduction of the instrument into the mouth of the canal, in the case of children, is difficult because the mucous membrane is so apt to be swollen and tense.

The ostium pharyngeum tubæ, is not so far back in the mouth as in adults, and the small undeveloped lips of the opening lie so far apart, that we often have trouble even on the cadaver of an infant, to put the instrument in the proper opening. In many cases it is well to draw down the upper lip of the patient with the finger, and thus make the entrance to the nose easier. As soon as the catheter has entered the nose, the direction of the instrument must be changed from downwards, to a straight one; else we may get into the mid-

dle nasal fossa, through which it is difficult to pass the instrument backwards, and it is quite often impossible to turn it here so that the point may enter the opening of the canal. The inferior nasal fossa, and floor of the nose, are by far less sensitive than the middle fossa, and is the only one through which the instrument should be introduced. Only in very rare cases is there any danger after once having fully entered the inferior meatus, of changing to the middle. If the catheter has been properly introduced into the inferior meatus, it will form a right angle with a line drawn across the face ; if in the middle an acute. It is a rule, in introducing the instrument, that the bulbous end should incline downwards.

If there are any impediments to this direction, we should try by gentle side motions to overcome them. The outer extremity of the instrument should be held lightly but still firmly in the hand. I have sometimes, in attempting to overcome some obstruction in the nasal canal, been obliged to turn the instrument directly on its axis, similarly to what is done in introducing the urethral catheter called " le tour du maître." If we cannot then pass the instrument, or if it causes pain, we must chose another catheter, of another angle and calibre. I have observed more such hindrances on the left than on the right side, so that I would advise you to begin your examinations with the right side.

Occasionally, but rarely, a case occurs where one side of the nose is impassable. This can occur in consequence of abnormal narrowing of the inferior meatus, as well as from nasal polypi, and from a particularly oblique position of the nasal wall of partition. I found in the case of a young girl, the cartilaginous septum so abnormal in position as only to permit the passage of a very small sound.

We can bring more deeply lying abnormal appearances to light, by means of the speculum and laryngoscope. In some cases where one nasal meatus is impassable, the Eustachian tube of this side can be entered from the opposite side, an operation that was thought to be impossible at one time. It is of course not so simple and safe as the direct method, but it can be done when necessary.

The introduction of the catheter, however, is not hard to learn and practise, if the surgeon will but give a little time to

it. Practise it first on the half head, then on the dead subject, then on yourselves. You are sure it is in the right position from the fact that, when introduced, it does not interfere with speaking or swallowing, that the point cannot be turned any further up, and that the air blown in is felt to come upon the ear. If properly introduced, it causes no pain; most patients, at the greatest, speak only of an unpleasant feeling; of a tickling in the throat, while the operation is being performed for the first time. It is almost never experienced in a repetition. These unpleasant feelings occur at the first time, because we are dealing with parts that are scarcely ever touched. When there are natural hindrances to the passage of the instrument, abnormal narrowness of the canal, etc., the operation cannot be performed without pain, but these are exceptions. More inconvenience is caused when the instrument is introduced with uncertainty and want of skill; although we very often have to deal with a membrane that is hyperæmic, and catarrh of the cavity of the tympanum is very often connected with catarrh of the pharynx; yet this unpleasant sensation scarcely ever amounts to a pain, and it is only in cases of great irritation that sneezing fits occur. The sensitive membrane soon becomes accustomed to the feeling of the instrument, and we can soon pass from a slender and small angled one to a larger. Sometimes it happens, especially in the first trial, in very sensitive and anxious patients, that a spasm of the muscles of the pharynx and palate occurs; and the instrument, if not already in the mouth of the tube, is held fast, and prevented from any further motion, while from the severe pressure on the mucous membrane much harm is done.

The surgeon should endeavor to quiet the patient, endeavor to persuade him to open the spasmodically closed eyes, and look calmly on him, while he lightly turns the catheter to the proper position. The patient must neither speak nor swallow, before the instrument is in the entrance to the Eustachian tube. The quieter and more confiding the patient, so much the easier is the operation for the surgeon.

The more decided the surgeon is in his manner, the less time he wastes in telling what is about to happen; the easier, especially with nervous patients, will the operation be performed. As to other accidents which may occur, there is

the so much feared emphysema of the neck, occasioned by air passing through a perforation of the mucous membrane. I have seen two such cases, in both of which I had often introduced the catheter, and no unpleasant symptoms had occurred.

We find on the cadaver erosions, and trifling ulcerations about the mouth of the tube, and these are not to be diagnosticated without the Rhinoscope, and can easily produce emphysema. It is very evident that such a delicate membrane, as we have here, can be very easily injured. These air tumors affect the swallowing, and are frightful to the patient. I have seen no further evil consequences. In one case all the symptoms disappeared in twelve hours, in another in twenty-four. One of the patients very naively remarked, that his neck felt like veal, that had been blown up by the butcher. *Turnbull*, in London, is said to have lost two patients, some twenty years ago, from the use of the Eustachian catheter. Even if the compression pump were too strongly filled, which he had intrusted to the patient, it is hard to see from the published account of the autopsy how the accidents occurred.* We know how common a thing is hæmorrhage from the nose, and that in some people it is induced simply by a severe fit of sneezing. We will not wonder, then, that the catheter is sometimes tinged with blood. This happens often enough, when not the slightest pain or inconvenience has been caused. If such bleedings return or continue, a solution of alum gr. ij., aquæ ʒ i., can be snuffed up the nose, and this will probably soon check the disposition. An increased secretion of tears, often causing them to run over the

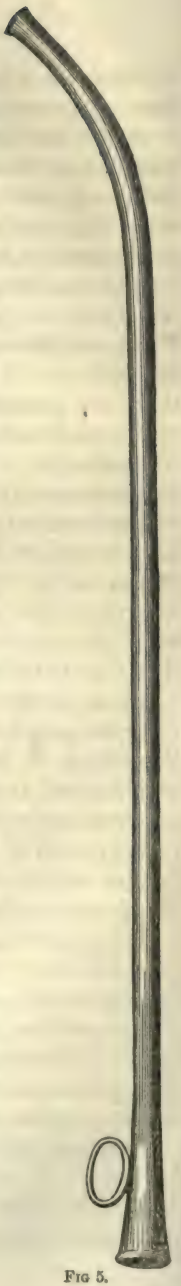


Fig 5.

* See M. Frank's Handbook of Aural Surgery, p. 173. Handbuch der Ohrenheilkunde.

cheek, is often occasioned by the catheter, without, however, exciting any pain.

We should have several sizes of the instrument. In my opinion it is the angle of curvature rather than the degree of thickness, which should be varied. This is in order to accommodate it for the variable width and height of the inferior nasal meatus, as well as for the variable distance between the posterior extremity of the nasal septum, and the mouth of the Eustachian tube.

Three different sizes will be sufficient; if made of solid silver, the curvature may be altered to suit each case.

Elastic catheters are not so serviceable as silver, they never impart as sure a feeling to the operator as the metal ones. The nasal passage is more easily passed through by them, but the mouth of the canal is harder to be found, and we cannot set as strong a stream of air through such a tube as through one with solid walls.

LECTURE X.

THE USE OF THE EUSTACHIAN CATHETER AS A MEANS OF DIAGNOSIS AND CURE.

Auscultation of the Ear.—The Otoscope and Air-Bath.—Substitute for the Catheter.—Manifold Use of the Catheter in Aural Surgery.—Operation of the Air-Bath.—The Catheter a Vehicle for Communicating Gaseous, Fluid and Solid Substances into the Middle Ear.—Compression Pump.

Gentlemen—After having learned the mode of introducing the Eustachian catheter, the question occurs, what is the value of its use, and in what cases can we employ it. A general answer may be made as follows. Its use is so to open the Eustachian canal and cavity of the middle ear that we may produce an effect upon them by remedies, whose application is rendered possible. This by other means is not possible, except when the membrana tympani, and thus the middle ear is exposed. (Politzer, in Vienna, sometimes places a small tube in the nasal meatus, causes the patient to shut his mouth, and swallow, and while he does this, the surgeon blows through the tube, and the air must pass into the Eustachian canal, having no other exit?) We have first to speak of auscultation of the ear, first described by Laennec. *Traité de l'Auscultation médiate.* Paris, 1837, 4 ed., vol. iii., p. 535.

Auscultation gives us a great many hints as to the condition of the middle ear, as well as of the Eustachian tube. Surgeons are apt to say that the ear is not accessible in a diagnostic as well as therapeutic view. Access to it, however, is far easier than in some other organs. If we wish, however, to auscultate the lungs, or heart, we simply place our ear on the chest, this is the mediate method, or by means of the stethoscope. In the ear, the thing is not so simple, and we need more appliances than these. We must first introduce the catheter through

the nose, and after we have excited an artificial stream of air, we can auscultate. To this end we blow air in from the mouth, or from an air-pump. The sound of the air can then be heard by means of the otoscope. *Toynbee* has given this name to the gutta-percha tube, which he presented in 1853, in order to auscultate the sounds in the ear, when the patient closed the mouth and nose, and swallowed. The name and instrument are in the highest degree adapted to their purpose, and we avail ourselves of it, even to a still greater degree than the inventor.

Fig. 6.

If a full stream of air pass through an Eustachian tube of normal size and normal degree of moisture, it creates a sound, which *Delau* likens to the falling of rain upon a leaf, and therefore called "bruit de pluie." I would rather call it a knocking sound, *anschlage geräusch*, because we hear the stream of air passing on a dry, elastic membrane,—the drum,—and pushing this somewhat outward. The sound passes through the otoscope, and seems to the examiner very near him. The patient will exclaim that the air is passing *through* the ear, whereas it has only entered it. If the mucous membrane be covered with the normal secretion, the sharpness of tone is somewhat mollified, softer, not to say moist. Sometimes this knocking, rapping sound, has something hard and dry in it. This is accompanied by a peculiarly dry appearance of the membrana tympani, and we are able to conclude that there is a want of mucous secretion, such as often exists, after an inflammatory process has been going on, and also in old people. If the Eustachian tube has been obstructed through swelling of its membrane, the air enters, instead of in a full strong stream, in a thin and weak and interrupted one, often with a whistling sound, and it strikes most strongly on the membrana tympani, when the patient swallows. Frequently, you hear the air enter only during the act of swallowing.

If during the air bath, for thus we designate the air passing through the catheter into the middle ear, we hear a rattling sound, we must distinguish if it be far or near from the external ear, that is, if in the Eustachian canal or middle ear, if it be present in the beginning of the operation or continue during it all. Very often such sounds are occasioned only by the accidental presence of a larger than ordinary amount of mucus about the entrance to the canal. The mucous glands are very numerous at the pharyngeal entrance, so that we can distinguish their openings with the naked eye, and on the dead body we find a greater or less amount of mucus deposited here. We can often hear a very near whistling sound, if the membrana tympani has a very small perforation, and we will often find a drop or so of pus or mucus in the meatus, which has been driven through this hole from the cavity of the tympanum. If with the Otoscope we hear only a far removed and indistinct sound, we can refer it to various causes. The catheter may not be placed correctly, and then the patient will have a feeling as if the air passed in his throat and nose; a reintroduction will produce quite another sensation. The catheter may, however, be placed properly, and yet no distinct sound, or none at all be heard. The end may be covered by a fold of mucous membrane at the mouth of the tube, which prevents the free passage of air. The tube may be obstructed by means of accumulated and dried secretion, occurring in the thickening and swelling of the mucous membrane, not to speak of the very rare occurrence of an adherence of its walls to each other. We may also have a similar auscultatory experience, when the cavity of the tympanum is filled with secretion, or its walls adherent, through the swelling of the opposite surfaces. All of these are conditions which we will speak of more fully later on.

You will find that even with the greatest skill in the use of the catheter, and with the greatest amount of patience and intelligence on the part of the patient, much will remain in doubt after the first examination, and it will be necessary to repeat it again and again, in order to make a safe diagnosis as to the condition of the cavity of the tympanum, and the membrana tympani. The less certain and practised is the examiner, the less intelligent the patient, the less will the instrument reveal; but this is true of all methods of examination in all diseases.

The use of the catheter not only furnishes to the ear many evidences of disease, but also to the eye. If we examine the membrana tympani during the entrance of a stream of air, we may observe a very different effect upon this membrane, even with the same stream. Now it will be moved very much, and in its totality, outwards; now weakly and slowly; again only in single parts, while others will remain immovable. These and other symptoms which are noticed on and behind the membrana tympani during the passage of air, we are only able to indicate here, because, when we come to speak of catarrh of the middle ear, they will have another importance.

As has been said, the patients themselves generally feel the stream of air in the ear, or going out of it. This feeling of the patient, and the visible movement of the drum by the stream, are not always in equal proportion. Sometimes the patient does not feel the air at all, and yet the membrane is pushed outward. I remember a case, where the patient, whose statement I thought perfectly reliable, said that he never felt the air passing on the ear, on one side, after two weeks of treatment, while on the other he had the usual sensation. Nevertheless, the movement of the membrana tympani, on the side on which he heard nothing, was greater than on the other. This was a case of complete want of sensation, anæsthetic condition of the cavity of the tympanum and membrane.

Many physicians, even some aural surgeons, think they can substitute for the passing of the catheter, the well known experiment of pressing the air into the cavity of the tympanum, when the mouth and nostrils are closed. This is called the Valsalvian experiment. In many individuals, especially those very deaf, it certainly costs more time and trouble to explain this method and teach it, than is necessary to introduce the catheter and inject air. Moreover, this substitute obliges us to rely on the patient's reliability of statement for our diagnosis, unless we examine the membrana tympani during the experiment, which we will not be able to accomplish except with intelligent patients. Further, we are taught no more by this experiment, than that the tube is open; how it and the cavity of the tympanum are otherwise situated, we are not able to learn. Then, again, patients who are well acquainted with

this method, are not able to press air in, while a strong blowing through the catheter proves the permeability of the tube.

This mode, then, as opposed to the introduction of the catheter, is much less valuable in diagnostic value, less practical, and sometimes even leading to false conclusions.

The introduction of the catheter as a diagnostic means, is still less displaced by the method which *Toynbee* in London recommended. *Toynbee* caused the patient to swallow, while he auscultates the ear with the otoscope. If the Eustachian tube is permeable, a peculiar cracking sound is said to be heard, which is not the case if it be closed. *Toynbee* himself, however, confesses that the sound is sometimes wanting, when we know by other means that the tube is permeable. In short we have only to read the testimony of the author (on page 196, of his "Diseases of the Ear,") to convince ourselves, how unreliable for diagnosis, and little to be trusted, the method is, and how incorrectly *Toynbee*, who is so highly to be esteemed as a pathological anatomist, substitutes this for the use of the catheter. This method, however, has its uses. If we look at the membrana tympani while the patient swallows with his mouth and nose closed, we find a variable condition of the membrane. Now on its inferior segment, it moves outwards again, and more commonly, it is drawn inward on its lower portion, and pushed out above, and sometimes does not move at all, although the tube is permeable both for the catheter, and the patient's own pressing in of air, and these motions are sometimes perceived with this experiment, when the Valsalvian experiment has had only a negative result.

We should also mention a new aid to examination, which Dr. Politzer of Vienna has introduced, by no means, however, as a substitute for the introduction of the catheter. He introduces a gutta-percha stopper in the ear, in which there is fastened a horse-shoe-shaped glass air measurer; a drop of colored fluid in this rises, and falls, according as the air in the cavity of the tympanum is thinned by swallowing, when the breath is held, or pressed upon by the Valsalvian experiment. Politzer has shown that this method is of great use and importance in a physiological sense. It remains to be shown, if there be much of practical value in it.*

* See Sitsung's Berichte Wiener Academie. March, 1861. Gazette Medicale

However, if the introduction of the catheter, as a means of diagnosis, can be set aside, and avoided, there is still another point to be considered, and that is,—its therapeutic value.

The Eustachian catheter is more important, by far, for the treatment of disease, than for diagnosis. In many cases we can diagnosticate catarrh of the cavity of the tympanum, from the appearance of the membrana tympani, without any catheter, but we cannot treat it without its aid. Whoever does not use the catheter deprives himself of the single, reliable means, whereby the majority of deaf persons can be locally treated, and he must confine himself to constitutional treatment alone, which is of very little value in these cases.

We often benefit the patient at the first use of the instrument, although we are merely using it for diagnosis and prognosis.

How then does the use of the catheter do good in the treatment of aural disease? What therapeutic value has the instrument? We will refer to facts which have been observed, and let these answer the question.

If we examine the membrana tympani, while a strong stream of air is passing into the middle ear, we will see in all cases, where it is not met by hindrances, that the membrana tympani is more or less moved outward. We are not only able to hear the motion, but we can convince ourselves with our eyes, that this stream of air not only enters the cavity of the tympanum, but that it also has a certain mechanical power. It is evident, that if there is such an effect on the membrana tympani, there must have been a considerable effect, while the stream was on the way. The walls of the Eustachian trumpet are not only separated from each other, but also all hindrances in it and the cavity of the tympanum, such as mucus and pus, will be put in motion, and driven either into the mastoid cells, or in the throat. This air-bath, if we may so designate it, works as a cleanser of the Eustachian tube, and of the cavity of the tympanum, and restores the connection between the throat and the latter, if this has been interrupted.

Moreover, since we can follow the process with the eye, and see the membrana tympani moved outward, we see that some

de Paris, 1861, p. 398. Wiener medicinische Wochenschrift, 1861, No. 12, and 1862, Nos. 13 and 14.

abnormal adhesions of this membrane must of necessity be stretched, and perhaps be loosened. This last named mechanical process on adhesions in the cavity of the tympanum, we have only to verify.*

We learn from this that we quite often loosen a synechia in the cavity of the tympanum, in the cases where only one introduction of the catheter has been of great use in restoring hearing; cases, which have hitherto been called accumulations of mucus in the middle ear. This above mentioned effect of the air-bath, which is quite common, because the adhesive process in the cavity of the tympanum is among the frequent of the pathological conditions in the ear, has been hitherto entirely overlooked by aural surgeons. This fact is only to be explained by the neglect of examination, and the insufficience of the previous methods of illuminating the ear. We should never omit, after the air-bath, to examine the ear very carefully, because we are thus enabled to see what effect we have produced, and on what anatomical consideration this improvement in hearing depends. Up to this time, all the observations which have been made as to the effect of condensing or rarefying the air in the cavity of the tympanum, have been referred to the effect made upon the membrana tympani, as if it were not a mechanical law, that effects should be made in all directions where the stream of air passes. *Politzer* was the first to show the one-sidedness of this view, and he showed experimentally, that each effect of rarefying or condensing the air in the cavity of the tympanum must be produced not only on the membrana tympani, bnt also on both the fenestræ.

Repeated introduction of streams of air will remove a recent or commencing rigidity, can possibly break up an anchylosis of the stapes, and may restore the lost elasticity of the membrane of the fenestra rotunda.

These adhesive processes occur very often in these parts, and their occurrence has great effect in diminishing the hearing, therefore the use of the catheter is very important.

I may take this opportunity to speak of an objection, which older members of the profession make to the use of the catheter. Many fear to use it, because they believe it is very easy

* *Vide* Virchow's Archives, vol. 17, section 5.

to blow mucus from the throat into the cavity of the tympanum, and thereby cause injury. I doubt not but that this first sometimes occurs; but if we do not stop at a single blowing, the mucus will certainly come out again into the throat, or into the cells of the mastoid process, which lie on the same plane with the entrance into the cavity of the tympanum from the Eustachian tube. Consequently the course and power of the stream of air must be directed against it. I have never seen any injury produced from blowing air into the cavity of the tympanum, although I have certainly introduced the catheter 25,000 times, and the air-bath through it. We should call to the recollection of these theoretical gentlemen, that the catheter is much smaller than the entrance to the pharyngeal tube, and that consequently it is not tightly held by it, and there is always a large returning stream of air, in which will fall all the irritating moving bodies before the bony portion of the canal is reached. The tenacious mucus, which is in the throat, will certainly be oftener blown in the mouth than in the ear. There are other objections, such as that the catheter irritates the mucous membrane, a view which Toynbee also takes, but these are still less reasonable objections, and they have no force, until some one wishes to use the catheter, to whom the whole operation is perfectly obscure. We may say, that *Rau's* remark may be applied here, when he says: "The principal objection of most opponents is want of dexterity in the use of the catheter."

The effects of the catheter, which we have hitherto observed, are generally transient in their nature, or at least gradually diminishing in value. It is generally desired to secure a lasting influence on the affected membrane of the middle ear, for after the removal of the secretion, or the separation of the opposing surfaces, the mucous membrane will still remain affected. The local treatment is only possible with the Eustachian catheter; it serves as a vehicle for introducing various remedies, which work directly on the tube and on the cavity. Such medicaments are either in the form of fluids, or of vapor or gases. I consider the injecting of fluid remedies into the middle ear, which is done so much by aurists, as useless. If we consider the ascending course of the Eustachian tube, and its narrowness in some places, it is clear that a fluid

can only be injected with a certain force. In this case, however, the greater part of the fluid will be driven into the cells of the mastoid process, whose entrance lies at the same height with that of the tube, while another part will not set over the narrowest part of the canal, but go back into the throat. We cannot then say with the least certainty how much of the fluid which we wish to inject will be found in the cavity of the tympanum, how much in the throat, and how much in the mastoid cells. Furthermore, we are not able to provide for the equal distribution of the fluid on the walls of the cavity of the tympanum, so that possibly a portion will not be touched at all, while another receives a strong dose. At any rate, that portion which does enter will be removed from the flat walls, and collected on the floor of the cavity, or in its various crannies, as for instance on the fenestra rotunda. The caustic remedies, such as a strong solution of caustic potassa, can very easily do great damage in those parts where they must speedily collect. This may happen with the use of a very small number of drops, which aural surgeons generally confine themselves to. If, however, we inject a large quantity, completely filling the middle ear, great damage can be done, on account of the softness of the parts. A case is related by a Venetian physician, in which severe effects were produced by such injections. One patient was affected with vertigo for ten full hours after the injection of warm water into the cavity of the tympanum. In another case periodical pain in the ear was added to the deafness. I advise you then, gentlemen, to make no injections of fluids through the catheter. You will not be able to restrain their effects, or to be assured of any good, but you can do great harm to the patient, and Hippocrates says "*Primo non nocere.*" If you wish to introduce remedies into the tube and cavity of the tympanum, according to my view, it can only be in the form of gases. It is true that the choice of remedies for the treatment of ear diseases becomes, therefore, rather limited, but on the other hand, their application and effect has a certain safety. In the application of vapor through the catheter, we must remember that the ear trumpet, or Eustachian tube, is very narrow for some distance, and that it is still more narrowed by a light apposition of the two surfaces; further, that the stream will moisten the mucous membrane

and cause it to swell. If we will be certain that the gases or steam that we use will reach the cavity of the tympanum, we must connect the apparatus for the manufacture of the gas with a pump, so that the vapor may be driven forward with a certain force. In a case of necessity we can use our own lungs, or a gutta percha bottle, as a means of pressing in the vapor. If one has to deal with many patients this will become very tiresome. I use a compression pump, not only

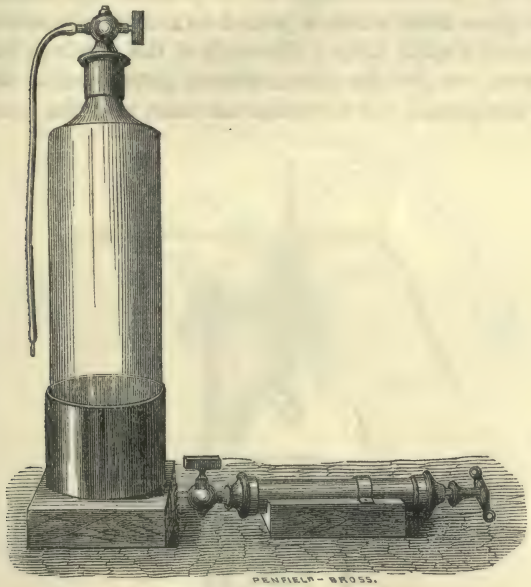


Fig. 7.

for the air bath, but also for the treatment with vapors and gases. My apparatus consists of a quite thick glass bell, 40 centimetres high, and twelve broad, which is fastened on a wooden support, by means of a strong measuring tub. There is connected with this a pump 20 centimetres long and 4 ctm. in diameter, which with its wooden support rests on the table. In the tube which connects the bell with the pump, there is a faucet which has an opening for the entrance of external air, and is besides perforated by a horizontal opening, through which canal the air pressed by the

pump passes. The faucet for the regulation of the exit of air is on the top of the bell, and there is a gutta percha tube added to it, which leads the air into the catheter or heating apparatus. The measuring tub at the bottom of the glass bell is fastened on by a screw, which must be air-tight, and this admits of removal for cleaning. I have tried very many apparatus, and I believe the one which I have just described as the best. * * This instrument is manufactured for 36 guldens, about $19.) As a contrivance for the generation of steam, I use a simple glass flask, which is placed on a sand bath, and heated by means of a spirit lamp. The cork of the bottle is bored in four places, one for the funnel-shaped glass tube to which a stopper is adjusted, one for a thermometer, and the remaining

Fig. 8.

two for the entrance and exit of the heated air, connecting respectively with the gutta percha tube from the pump and with the catheter. In order to steady the flask, an iron sup-

port goes from one of the legs of the stand, as seen in the plate. When there is no necessity for the regulation of the temperature only two holes are necessary in the stopper of the flask.

A number of instruments are recommended for securing the catheter in its place, during the operation of pumping heated air or steam into the Eustachian tube. The best one is that of Rau's, modified, consisting of forceps, for holding the catheter, attached to a pair of spectacles. The forceps are fastened by a strong spectacle frame, by means of a movable slide with an adjusting screw. The forceps are spring instead of screw, as given by Rau, with wing-shaped extremities.

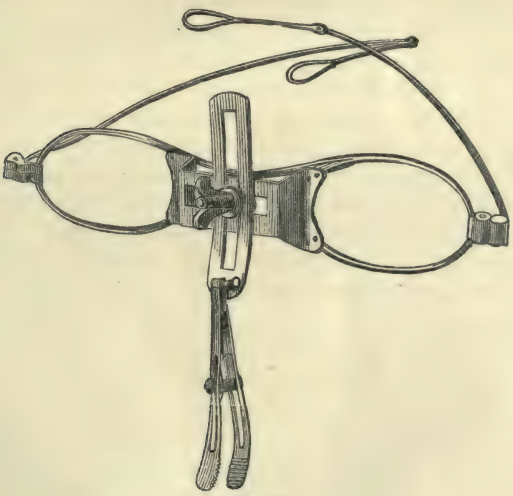


FIG. 9.

If the catheter has been fastened in its position by means of this forceps, the patient can speak or swallow, or even sneeze, without being in danger of displacing it.

When you wish to give the air bath, place the patient near the table on which the pump stands, and either hold yourself the tube connecting with the catheter, or intrust this to the patient, and it will be the same when the heating flask is between the patient and the catheter. The most of patients soon learn to hold it securely so that the air or steam passes in

freely. This is generally best attained by allowing the catheter to press a little against the nasal septum, which allows the beak of the instrument to lie a little deeper in the lips of the Eustachian tube.

Finally, we have only to say, that the catheter may be used as a vehicle for the introduction of solid bodies, such as metal sounds, or copper wires—for transmitting electricity. We will later on learn the special use of this.

LECTURE XI.

SIMPLE ACUTE AURAL CATARRH.

Different Forms of Catarrh of the Middle Ear.—Acute Catarrh, its Symptoms and Consequences.—Treatment.

Gentlemen—We come to-day to the diseases of the middle ear, and first to the inflammations of its mucous membrane. Catarrh of the middle ear, may be designated as either Simple or Purulent, and each has an acute and chronic form. A primary inflammation of the bony wall of the middle ear hardly occurs, any more than a periostitis of the external auditory canal, of which we have previously spoken. The separation of the mucous from the bony covering of the middle ear, is anatomically impossible ; and how shall we distinguish their different affections ? Here, still more than in the bony part of the external auditory canal, each intensive inflammation of the covering of skin must bring with it an interruption of the functions of the bone lying under it ; for the membrane which we are accustomed to call mucous, is at the same time the carrier of the vessels for the bone, it is also periosteum as well as mucous membrane. Every inflammation of the cavity of the membrana tympani is also an inflammation of the periosteum ; every catarrh a periostitis. If the inflammation be chronic in its course, a thickening of the mucous membrane, and a hypertrophy of the bone, a hyperostosis more easily occurs ; while in acute processes it is known that the mucous membrane inclines more to ulceration, and the periosteum to atrophy of the bone, inflammatory softening and superficial caries. I have often seen diseases of the bones of the middle ear, as the result of very acute or long existing inflammation of its soft parts. I have, however, seen no cases of primary periostitis, and according to my views such exists only in nomenclature, and is to be adhered to only by a straining of facts.

Simple Acute Catarrh of the Middle Ear.—For the sake of brevity, and as only the middle ear is covered with mucous membrane, we may say, *Acute Catarrh of the Ear*, or *Acute Aural Catarrh.*

I have hitherto observed these cases, mostly in the early spring and late fall, developing themselves after "catching cold," such as getting wet through, and generally in connection with other catarrhal inflammations of the nasal passages or fauces. It may be said, in general, that persons inclined to inflammations of mucous membranes are very apt to have inflammations of the middle ear. We often find the acute form arising in many cases, when the patients have been suffering for a long time from the chronic form; the most cases which I have observed, have been those where the patient has suffered for a long time from deafness of one side, in consequence of chronic catarrh, and the hitherto healthy ear would then be attacked with the acute disease. People who to all appearances had heard well, certainly well enough for all their duties, had suddenly become limited to hearing only the loudest sounds. I have observed these cases especially often in men in middle life, often extending from a secondary syphilitic eruption upon the mucous membrane of the mouth. I have only seen seven cases, in which the aural catarrh was on but one side; and on close examination, you will almost never find the other ear entirely free from disease. The deafness of the most prominently affected ear is generally of a high degree; not seldom a total deafness exists. The loss of hearing generally occurs quite suddenly, and is consequently the more marked; and yet the patient will often remember that some time before the sudden seizure, he had noticed a slight occasional diminution of his sharpness of hearing. With the deafness, the patient sometimes experiences nothing more than a feeling of pressure and fulness in the ear. Much more commonly, however, there is in the first stage of the affection severe pain referred to the deep parts of the ear, sometimes lasting only a night, and occasionally some days, with intervals; always exacerbating at night, and which, causing so much loss of sleep, pulls the patient down very rapidly. This pain is not increased by pulling upon the meatus auditorius externus, or by pressure in the vicinity of the outer ear; but is increased by swal-

lowing, or any motion of the jaw or general movement of the head. In one case the taking of cold water caused so much pain, that it was obliged to be warmed before using it. This pain is often accompanied by toothache, and it must be here stated that pain in the molar teeth is often hard to distinguish from pain in the middle ear. In severe cases, the pain will be referred to the mastoid process, and this is sensitive to strong pressure, when no external evidences of disease can be discerned. The pain generally runs over the whole side of the head, being more severe in the front part, in the region of the frontal sinus. Noises in the ear are scarcely ever wanting, and they form part of the greatest trouble of the patient, on account of the great hammering and pounding going on there. One patient said it seemed to him as if an empty barrel were struck upon close to his head. The patients are often in doubt if these noises are not real ones being made near them. Add to all this, that the patients have an intense heaviness in the head, however quietly they may lie in bed, and often returning vertigo; that febrile symptoms of variable degree scarcely ever fail, which increase in the evening almost to delirium; and you will more easily understand how it is that persons who a few days ago were not disturbed in the least in understanding all that was said, and not at all hindered in their daily occupation, now bear in their faces the picture of most intense anxiety, while with wide-opened eyes they listen for each word which has no sound for them; and in what haste they are to know whence come these symptoms, and how they are made helpless by fever, pain, and loss of sleep.

You will understand, I say, how the patients make the impression of delirium upon you, and you will not wonder that acute catarrh of the ear is sometimes called meningitis, or acute congestion of the brain, especially when the pain in the ear has been so extended as no longer to be locally distinguished, when the deafness on the one side escapes notice, and thus the attention of the surgeon is in no respect turned to the ear.

I can assure you that many persons have come to me with "nervous deafness," according to the statement of their physicians, induced by an inflammation of the brain, which an examination of the ear showed to be a consequence of acute catarrh of the cavity of the tympanum.

It is especially hard to distinguish acute aural catarrh, in the case of children, from a congested condition of the brain, and it seems probable to me, from some anatomical facts which I will lay before you in the course of these lectures, that purulent catarrh very often occurs in children, and that its symptoms are very often mistaken.

You remember the connection of the vessels of the cavity of the tympanum, and of the dura mater, which is made by means of branches of the Arteria meningea media. We can refer every peculiar vertigo and irritation of the brain to this fact.

We should remember, however, that some of these symptoms may be due to consecutive hyperæmia of the labyrinth, or partly to the pressure of the collected secretion on the membranes of the fenestræ. If we examine the ear, during an attack of acute catarrh, we will find the external auditory canal wholly unaltered, if we except an increased redness of the membrana tympani. In trivial cases this only appears as a light red mingled with the grey color of the membrane, communicated from the injection of the mucous membrane of the cavity of the tympanum. In this way the shining appearance of the drum is lessened, or may be entirely removed. It ceases to reflect the light evenly in some portions in consequence of its infiltration, and thus the coniform light spot, which we are accustomed to see on the membrana tympani, on the anterior and lower portion, can no longer be discerned. The handle of the malleus, in all cases where the surface of the membrane is not much affected, remains plainly visible, and this is a point which helps us in our exclusive diagnosis ; for in such a case, the situation of the affection must be deeper than the membrana tympani. In some cases, however, in consequence of the greater infiltration of the epidermis and cutis, we can no longer see the handle of the malleus. The vessel running over it will be seen filled with blood, so that we have a red line in the middle of the membrane, running from above downward, and the surface of the drum appears dull, of a bluish grey color. Sometimes minute vessels are seen in the periphery of the membrane, which is uneven, either in consequence of the increased secretion pushing it forward, or of swelling of the various parts.

These appearances are of course dependent upon the severity

of the attack, and on how long the process has gone on, before an examination takes place. If there has been previous inflammation and thickening of the membrana tympani, these symptoms of hyperæmia will not appear. In cases of long continued chronic catarrh, and when a sub-acute attack supervenes, all these symptoms will be less prominent. If we examine the ear, in later stages of the affection, the membrane does not appear to have lost so much of its brilliancy; the coniform point of light is changed, however—generally lessened in size. The membrane has something of a dull lead color, and here and there, perhaps, a white or yellow appearance. It is abnormally concave, and there is often seen a band running over from the processus brevis mallei, which has something to do with its concavity. I have never seen any redness or swelling of the external parts, in the vicinity of the ear, during the affection; sometimes they are somewhat tender on pressure. We find, however, that the throat participates in the attack, there being always a severe injection of the fauces. There is generally pain and difficulty in swallowing, stuffing of the nasal meatus, dryness of the mouth, and other catarrhal symptoms. Many patients speak of a sensation in swallowing, as of sounds pressing against the ear, accompanied by variations in hearing. After the sense of heaviness in the head and the febrile symptoms have disappeared, the dull feeling in the ear and deafness remain for a long time. Crackling occurs oftener in the ear, and the patient always has the hope that some time, sooner or later, the loud report, so famous for being the prelude to restoration to hearing, will occur, and he will be well again. It is really true that we may occasionally observe such a case, where a patient hears a loud report in his ear, during sneezing or yawning, and that the hearing is greatly improved after it. In many other cases, however, in spite of treatment it remains for months and years the same, until at last the catheter is introduced.

Prognosis.—This must be considered good, in a case of simple acute catarrh of the ear, where it has not gone on to perforation of the membrana tympani. The deafness can almost always be somewhat improved. There is, however, somewhat of uncertainty in the prognosis, in that relapses are of frequent occurrence, and still oftener an inclination to continue as chronic catarrh.

We may very often see cases, in which, after an attack of acute catarrh, the hearing is completely restored, and is sufficient for all purposes, and then hardness of hearing again appears, without any other symptoms. In some cases, however, sub-acute symptoms accompany this gradual loss of hearing power. Many patients will remember an acute attack, during which they were entirely deaf, but recovered the hearing power by means of constitutional treatment, and in the course of years have become gradually deaf. These facts may be explained in two ways. In persons who have had an acute attack of catarrh, of any kind, there remains a tendency to the same affection. There are also some reasons drawn from anatomical considerations. Among the most common consequences of acute aural catarrh, are thickenings of the mucous membrane covering the cavity of the tympanum, and also the formation of various adhesions, which are developed from the previous contact with the swollen membrane, and especially the connection of the different parts of the middle ear, which are normally separated from each other. Such adhesions occur most commonly between the membrana tympani and promontory, between the membrane and the incus, or the same and the head of the stapes, and still more often between the two niches of the fenestra ovalis and rotunda. It is clear that when such adhesions have taken place, and the space of the cavity is so much diminished, each swelling of the mucous membrane, such as occurs with every cold in the head, is of importance. Each congestion of the membrane, however small, which could produce no effect upon a normal cavity, will, in one that has been narrowed as above described, produce an effect which will diminish, in a sensible degree, the sharpness of hearing. Furthermore, we may believe that these adhesions, and growing together of the walls, even if they do little harm to the hearing, are a source of irritation, which may be the basis for a congested condition. It is well known that such a condition of things is observed in the eye, when in consequence of adhesions between the iris and the capsule of the lens, the so-called posterior synechia takes place. In the accommodative process, and in all the movements of the iris, there becomes an irregularity of motion and abnormal tension. A constant state of congestion follows, which gives rise to repeated attacks of inflam-

mation. What was once explained as resulting from a "rheumatic diathesis," now can be explained as from a pure mechanical cause, since the first inflammation left the *damnum permanens* behind, from which a constant influence is excited on the iris.

There is a similar condition of things in the ear, even if we are not correct in ascribing a certain amount of accommodating power to the stapedius and tensor tympani muscles. Still their co-existence and muscular structure give evidence that they are the source of motion to the parts on which they act. These motions must certainly be irregular, and out of harmony, if the parts to be acted upon are confined to a certain degree by adhesions. We may conclude that in the ear, as well as in the eye, a congested condition is maintained by such a synechia, and made the ground of repeated attacks of inflammation. As each iritis, which leaves behind a synechia, retains a tendency to a return of the inflammation, and to formation of new adhesions, so we must believe that each catarrh of the cavity of the tympanum will more or less affect the ear injuriously later, and the more that adhesions have been left behind.

Treatment.—We shall best accomplish this, and prevent the above results, if the catheter be introduced as soon as possible. According to the advice of authors I formerly delayed the introduction of the instrument until the acute inflammatory symptoms had disappeared, lest I should excite pain, and do injury to the parts. I have satisfied myself, by many experiments, that we by no means are obliged to wait so long, and that we shorten the inflammatory process so much the earlier by introducing the catheter. I have sometimes introduced the instrument at a time when the membrana tympani was greatly injected, and the patient had intense pain in the ear. Instead of an increase of pain from the introduction of air, the patient always found it lessened, if not at the very moment, at least in a short time after. In short, the patient began to improve from that time. Recall the condition of the ear during the inflammatory process, and you will explain this. The membrane is everywhere swollen, secretion increased. This secretion fills the cells of the mastoid process as well as the cavity of the tympanum, and this secretion cannot find exit, because the Eustachian tube, which is of the same structure,

is affected in the same manner, and its swollen walls prevent egress. If we re-open this passage by a strong blowing in of air, the secretion will be softened, the pressure removed from the walls of the cavity of the tympanum, and especially from the susceptible membrana tympani. It often occurs, that we are not willing to attempt the introduction of the catheter on a suffering patient from fear of the impression which what may seem to him a great operation may make upon him.

You will use local blood-letting in the first stages, whether you are able to use the catheter or not, with a cathartic of calomel and jalap, 2–3 grains of the former, with 5–8 of the latter in a powder, of which 4–6 may be taken during 24 hours, and 4–6 leeches be applied, partly just anterior to, and partly just under the external meatus. The severe pain will generally cease with this treatment; when it does not, the ear may be filled every hour with warm water, which the patient allows to remain in about fifteen minutes. The patient should remain in bed, and gentle diaphoresis be produced (with aq. acetat. amm. in table-spoonful doses). We must look after the catarrhal symptoms of the fauces and nose, and so soon as motions of the throat can be borne, let the parts be gargled with an infusion of marsh mallow, to which a little borax is added. It is sometimes advised to give an emetic in these cases, especially tartrate of antimony and potash, or a remedy to cause sneezing, in order that by means of the severe shaking of the head, through the vomiting or sneezing, the mucus may find its way more easily through the Eustachian tube. I confess, I think that such a strong impression, as by severe sneezing or vomiting, may produce a somewhat dangerous effect on the membrana tympani,—since its rupture might be easily produced. The introduction of the catheter is certainly not accompanied by so much danger, and its effect is more easy to regulate. If the acute stages be once passed, the treatment is not different from that of chronic catarrh, which we will come to speak of in the next lecture.

LECTURE XII.

CHRONIC AURAL CATARRH.

Its Course and Subjective Symptoms.—Many Peculiar "Nervous" Symptoms.—Change in the Appearance and Color of the Membrana Tympani.—Thickening of the Membrane.—Calcareous Deposits.

GENTLEMEN—The chronic form of catarrh of the ear is certainly its most frequent affection, and most common cause of deafness. To describe it in brief, we may say that it consists of repeated swelling and gradual thickening of the mucous membrane of the middle ear, which process is generally accompanied by an increased secretion, while the membrane is in a state of congestion. Chronic catarrh is an affection of every time of life, occurring often in childhood, where it is oftener developed from an acute or sub-acute process. In advanced life it is often the cause of hardness of hearing. It cannot be denied that there often exists a hereditary disposition to chronic catarrh. I am acquainted with families who are long-lived and in other respects healthy persons, in which there is no trace of struma or tuberculosis, and when the greater number of the family, although in different circumstances in life, suffer from chronic catarrh, and as a consequence become partially deaf. The affection very often appears with persons of a strumous or tuberculous diathesis, and all persons who are apt to suffer from catarrh of any part of the mucous membrane. The subjective symptoms of chronic aural catarrh are often so trifling, that the patient is not able to designate the beginning of his complaint. The process often only makes itself known by its results, in a gradual and slowly increasing deafness, and which the patient only became aware of when it had reached a certain grade, sufficient to disturb him in his calling in life. Such cases, when the patient complains of no

further symptom, of no pain, no noises in the ear, no abnormal sounds, only a persistent and slowly developing deafness, are very commonly considered cases of nervous deafness, and are only to be explained by a thorough and exact examination of the parts, and especially of the membrana tympani. In very many cases, one subjective symptom,—noises in the ear,—is present in connection with the slowly increasing deafness. The pain which occurs in chronic aural catarrh is generally of short duration, appearing only when the patient is exposed to severe cold, or the ear to a draught of wind, and is described as a biting, gnawing pain, and soon passes away. The patients also complain of a feeling as if the ear were "stopped up," of fulness and heaviness in it, and these symptoms appear generally in the morning on awaking. It is a pure characteristic symptom of chronic catarrh, when patients complain that in the morning, after having slept very long, they feel an increased heaviness in the ear, and hardness of hearing.

Many are disturbed very much from sleep, by sounds, on placing the head on the pillow, which do not trouble them when up. This described feeling of fulness and heaviness in the ear increases, in many patients, with the slightest causes which can produce a congestion of the head, or which can check the passage of blood from it. We find, then, that after drinking wine or strong tea, after bending over at work, as, for instance, at the writing desk or embroidery frame, or when the patient is, from any cause, bodily or mentally fatigued, this feeling of fulness and heaviness appears. The influence of temperature is greatly felt in these cases, so that we find that patients hear the best in a cold dry season; and, on the contrary, the hearing power is much diminished in cold and wet weather, or in very severe summer heats. Sudden changes of temperature always affect the patient badly. Patients complain, especially, of hearing sounds as if muffled. If they pass from cold air into warm, there is seldom any unpleasant sensation, but if from warm to cold, they sometimes speak of pain occasioned. The noises in the ear are not heard so much in free, fresh air, as in a closed room, especially in one that is overheated. A number of these subjective symptoms depend on the chronic, irritated condition of the nasal passages and fauces, the membrane of which extends to the Eustachian tube.

There is still another class of symptoms, which are not uncommon in chronic catarrh. They may be explained partly by referring them to similar affections of the nasal passages, or of the frontal sinus, or to an increased pressure on the contents of the labyrinth, from long closure of the Eustachian tube, or an abnormal condition of the fenestræ ovalis and rotunda, or from an irritation of the otic ganglion, or the plexus of the sympathetic, situated in the cavity of the tympanum. These symptoms are as follows:

A continued feeling of pressure and heaviness in the head, so that vertigo often arises, a feeling of not being equal to any kind of mental exertion, each long-continued fixing of the attention being wearisome, and this, in people who were previously able to read and write for hours without any sense of weariness or oppression, but who, now, cannot continue any such employment but for a short time. Patients often express their symptoms by saying that thinking has become hard for them, they feel as if pressure were made upon the brain, or as if it were in motion. A young physician afflicted with this disease, said to me, "I can't seize an idea any more." In many cases, after long continued and severe mental labor, these symptoms of fulness and pressure increase to a severe pain in the head, which troubles the patient more than deafness and other symptoms. Other patients, and also those who are not at all to any sensible degree disturbed in their hearing power, speak of an unusual irritableness, of being suddenly without reason overcome by very sad thoughts and forebodings, which sometimes increase to weeping. For a long time, I considered these last named symptoms as only accidental, and noticed them in my history of cases, until their frequent recurrence suggested to me, that they were of some importance. They were present, not only in sensitive females, but also in the most clear and strong-minded men. The connection of these affections with the complaint was also established, in my mind, from the fact that after a purely local treatment they disappeared, and that they appeared in regular order, with a relapse of the affection.

You see, gentlemen, how many symptoms we have before us, which are generally classed together as nervous symptoms. You will not be very much surprised when I tell you that

formerly, the greater number of cases of chronic catarrh of the ear, were called *nervous*. You will understand the confounding of the diagnosis, when you understand that the changes in the membrana tympani which occur in this disease are of the kind which you could not distinguish in the previously practised methods of examination.

The objective symptoms are various and numerous, comprising not only what may be seen on the living, but also on the dead subject. First let us speak of the appearances, if we examine the living subject. The external auditory canal takes no part in the process; now it is very dry, again very full of cerumen. We have seen in our previous study, that the secreting power of the canal depends rather on the general cutis than on any morbid processes of the deeper parts. The external surface of the membrana tympani has generally the normal lustrous appearance, not speaking of those very old or subacute cases where it is dull and obscured. The shining coniform point of light is very often changed in appearance, its borders not seeming distinct, very seldom it seems increased in size, oftener reduced to a mere point, sometimes wholly disappears. All these latter named conditions indicate an alteration of the degree of tension of the membrana tympani. Vessels are only seen on the membrane when a recent congested condition is present, and these run over the handle of the malleus or behind it. The malleus is generally seen very distinctly, the corium not being thickened. Sometimes it is pushed forward or drawn back a little, in which case the processus brevis mallei is the more prominent. The membrana tympani is often abnormally concave, which we have already spoken of in our remarks on the adhesive process.

The appearance of the membrana tympani, in chronic aural catarrh, may be distinguished from that in the normal condition, in that it is less translucent, and somewhat thickened. The natural pearl gray appearance is changed to a dark gray; the color of the membrane, in the long continued course of the disease, passes through all the intermediate changes, from a whitish gray to a pearl white; from a lead color to a yellow. The periphery is often the most intensely gray, it often even appears as a distinctly defined ring of various width. On the edge where the mucous membrane of the cavity of the tympa-

num continues itself where, in a normal condition, the membrane is most developed, the morbid thickenings are the most extensive.

However, we do not always find the appearance of the membrana tympani much changed in chronic catarrh, when the cases are recent, but the catheter and the other symptoms verify our diagnosis. It often appears a little dull in its appearance, and moist, in which case a little yellow color is mingled, and some points are less translucent. The appearances are not equable, either in color or density. We often find, in the posterior half of the membrane, a spot in the form of a whitish gray, opaque half moon, which lies between the outer edge of the membrane and the handle of the malleus, so that there is a portion normally translucent in each direction. *Wilde* has likened this half moon shaped opacity to an arcus senilis cornea. It can be seen in young persons, and is by no means a constant appearance. We find also, in the same position, other calcareous deposits, beginning generally in a round shaped spot; this in its development may unite with the posterior half of the half moon shaped one, and thus form a ring in the shape of a long drawn out horse-shoe. These calcareous deposits are easily distinguishable from the tissues round about, and are not to be mistaken. They resemble atheromatous spots, on the internal coat of an artery. Sometimes they penetrate all the layers of the membrana tympani, sometimes they are situated next to the unchanged outer surface of the membrane. These calcareous deposits are seen in early youth, and with few exceptions they occur where there is a high degree of deafness, so that similar processes may have occurred on the membrane of the fenestra ovalis and f. rotunda. Besides these changes there sometimes appear thickened, varied colored lines running from the centre to the periphery, which are first plainly seen after the air bath, or blowing upon the membrana tympani.

There also appear peculiar white points on the membrana tympani, which undoubtedly have their situation in the mucous membrane, but of whose nature I can give no nearer idea.

LECTURE XIII.

SIMPLE CHRONIC CATARRH (CONTINUED).

Morbid Changes in the Fenestra Ovalis and Rotunda, and their Effect in Diminishing the Hearing Power.—The Value of Auscultation of the Ear as a Means of Diagnosis.

GENTLEMEN—Before we go on to a further consideration of the condition of the membrana tympani in chronic catarrh, and explain how another class of changes extend to it, I would like to call to your attention some anatomical considerations as to the cavity of the tympanum. I would especially remind you of the small size of the long diameter of the cavity, and how short the distance of the membrana tympani from the opposite wall of the labyrinth and the ossicula auditus. The long diameter of the cavity of the tympanum is from 3 to 4½ Mm., measured from the end of the handle of the malleus only 3 Mm.; furthermore the extremity of the long process of the incus is only 2 Mm. from the posterior and upper portion of the membrana tympani, while the head of the stapes is 3 Mm. Every swelling of the mucous membrane of course decreases their distances, and it may extend so far that the mucous surfaces may touch each other. Adhesions may occur from such a contact of the two membranes, or an abnormal connection by means of a pseudo-membrane. The less the distance of the parts from each other, the easier will such adhesions occur. We have further to remember that the cavity of the tympanum is connected to the wall of the labyrinth in two ways. First, by means of the chain of little bones of hearing, and by means of the tendons of the tensors of the tympanum, which pass obliquely through the cavity, so that an abnormal connexion of the opposite surfaces can easily occur.

We have previously seen how the presence of these adhesions may be determined by examining as to the convexity or

concavity of the membrana tympani during the administration of the air-bath through the catheter. Such adhesions are not only consequences of acute catarrh, but also occur in the course of the chronic form.

All these changes in the membrana tympani show us that its mucous surface has previously been the subject of inflammatory action, and the examinations of morbid anatomy show us, that the membrane is affected *in toto*, if, perhaps, in different degrees of intensity. Wherein any pathological examination of such a catarrhal process has shown us changes on the inner surface of the membrana tympani, we may conclude that the other parts of the membrane are also affected, especially if there be any considerable deafness. A number of changes of structure may exist, however, without disturbing the patient very materially. The hearing will be certainly not normal, but it may be amply sufficient for the ordinary wants of business and social life, so that the patient may be classed as among those who hear well, certainly not as among those who hear badly. There are a number of cases of hardness of hearing, which are unknown to the friends and companions of the patient, as well as to himself. Considerable thickenings of the membrana tympani, when they do not co-exist with other changes, are never accompanied by a high grade of deafness; and if such be present, we may be sure that morbid changes have taken place in other parts. Now, what further changes do we observe on the dead body, as a result of catarrh of the middle ear? It is only on the dead subject that we can learn the changes, other than these on the membrana tympani. The general thickening and solidifying of the mucous membrane of the middle ear is very often extended to the articulation of the little bones of hearing—the *ossicula auditus*, especially to the articulation of the malleus and incus, and the capsule of the joint becomes thicker, thus its motion is impaired and the articulation becomes rigid.

The fenestra ovalis and fenestra rotunda are among the most important parts which participate in the effects of a chronic catarrhal process. We often find the little bony canal, or niche on the end of which the membrane of the fenestra rotunda is attached, covered over with a pseudo-membrane, or the mucous membrane of the niche is hypertrophied, and thus

narrowed, or even entirely filled, and stopped up with thickened and vascular mucous membrane, as if closed with connective tissue. The so-called *membrana tympani secondaria*, or membrane of the fenestra rotunda, is often thickened and even calcified. It is clear, that when in this manner the elasticity of the membrane is impaired, or completely destroyed, it will be also true of the foot or base of the stapes (which is attached to the margin of the fenestra ovalis), since the fluid filling the labyrinth, and lying between the fenestræ, cannot oscillate from the absence of elastic walls. Similar morbid changes take place also in the membrane of the fenestra ovalis, which is connected with the base of the stapes. Sometimes the stapes is fixed in one direction or another by abnormal bands of adhesion. Sometimes it is wholly immovable in swollen mucous membrane, or covered with rigid connecting tissue. All these abnormal conditions of necessity interfere with the important function of the chain of little bones, and therewith with the labyrinth in its power of conducting sounds.

The above described changes on the fenestra ovalis and rotunda, are of a kind of which the membrana tympani gives no evidence. To this class also belong the very commonly seen abnormal bands, which lie between the membrana tympani and the different walls of the cavity of the tympanum, between the tendon of the tensor tympani and the ossicula auditus, and which more or less fill up the air-holding spaces which are between the contents of the cavity. More exact descriptions of the changes seen on the dead subject have no value, for each section shows different appearances. You will best understand the varying nature of the changes, by observing the various preparations which I lay before you.* It only remains to be said that such adhesive processes almost involve the tendons of the tensors of the tympanum, and the articulation of the incus with the stapes, being so favorably situated for these changes.

You see then, gentlemen, that the greater number of these changes can only be observed on the dead subject. We can only conjecture with some certainty as to an abnormal growth

* See Virchow's Archives, vol. 17, p. 1–80. Toynbee's Catalogue of Preparations Illustrative of Diseases of the Ear. London, 1857.

on the fenestra ovalis and rotunda, when we are dealing with cases of deafness of high grade, and the effects of these, in accordance with all our present knowledge, cannot be referred to an abnormal condition in the labyrinth or nervous system, but to catarrhal processes in the cavity of the tympanum. The greatest acoustical importance undoubtedly belongs to these two fenestræ; probably they are the most important of the whole peripheral portion of the sound conducting system; but our present stage of physiological diagnosis gives us no useful hypothesis, not to say certain diagnostic evidences, on which to base an opinion as to whether the abnormal condition is in the vestibule or cochlea or where. It is, however, to be believed that certain abnormal conditions of the middle ear are due to adhesive processes, which we cannot detect from any appearance of the membrana tympani.

These processes have an influence upon the kind of sounds heard in auscultating the ear, and we may thus get an occasional indication of their presence.

Among the sounds heard in auscultation, are peculiarly moist short clapping sounds, which from their nearness to the listener's ear, seem to be in the cavity of the tympanum, but which are easily to be distinguished from the formerly described knocking sounds. I am able, as yet, only to indicate these sounds, without giving you their relative importance. This latter can only be learned by post-mortems in cases where such sounds have been accurately noted before death, or possibly by auscultation on the cadaver. Even if in the greater number of cases, we are able to determine the existence of chronic catarrh, still a more exact examination of the patient by means of the air bath through the catheter, should always be had. We should see further on, in our meeting, what value this more close examination has for the prognosis. In this way we decide how much part the Eustachian canal takes in the process; if its mucous membrane be swollen or puffed out; if there be any abnormal mucous secretion in the tube or cavity of the tympanum. Very often it occurs that abnormal conditions of the membrana tympani first announce themselves after the air bath—for example the radiated adhesions, and the observations of the membrane during the passage of air into the cavity of the tympanum, as to its elasticity and mobility,

which can be determined in no other way. However, if we do consider the condition of the Eustachian tube as important for diagnosis in chronic catarrh, we must be careful lest we overestimate it, and draw conclusions which cannot properly be deduced. If the stream of air passes clearly and fully into the cavity of the tympanum, with no mingling of rattling, gurgling sounds, it proves nothing more than that at the moment of examination there is no abnormal swelling of the membrane or morbid increase of secretion. It certainly does not prove that such a condition did not precede the present, and that the hardness of hearing does not depend on changes in the middle ear—that is, on a catarrhal process. In many cases, the appearance of the membrana tympani, the history of the patient, in short all the other symptoms indicate for the cause of the ear affection a chronic catarrh of the middle ear, a thickening of the membrane, and yet the air passes through the canal without any hindrance or any sound indicating increase of secretion. Yes, we find in some extremely chronic cases of catarrh the stream of air passes into the ear with an extremely full tone, and this may be well observed when the patient is fully deaf in one ear, while in the other the inflammatory process is just developing itself. In the first ear, the sounds are full and free, while in the other, the later affected and better ear, there is considerable obstruction, and the air enters only with a thin whistling sound, or during swallowing. Very often, after a long continued inflammation, there appears a dryness of the external surface, and a shrinking of the connecting tissue, as, for instance, after intense trachoma, there is an abnormal dryness of conjunctiva, and a complete want of secretion (xerophthalmos). These facts observed on the living, will tell what should be seen on the cadaver.

I have often called your attention in my cited sections, to a remarkable width of the ear trumpet, in its upper section, and this was in cases where for a long time a great amount of purulent secretion had taken place in the cavity of the tympanum.* Here we may believe that a stretching of the walls had occurred, by means of the massing of the secretion,

* Virchow's Archiv, vol. 18, sec. 4. The same, Vol. 21, p. 299 and 300.

or that they were cases of old catarrh of the ear, which left behind morbid changes in the cavity of the tympanum.*

Catarrhal inflammations also occur, which are localized in the middle ear, and produce little or no change in the Eustachian tube. Finally, many of these processes are interstitial thickening of the tissue itself, and showing itself very little, in increase of secretion and exudation. In very many cases, every anomalous symptom from the Eustachian canal may be wanting on auscultation, and yet the hardness of hearing be due to a pathological condition of the mucous membrane of the cavity of the tympanum, to a chronic catarrhal inflammation. I dwell on this point, because so many practitioners have believed that they should only make the diagnosis "aural catarrh," when there are murmurs, and rattling sounds in the use of the catheter, and when the permeability of the Eustachian trumpet is removed or interfered with, for this reason "catarrh of the tube," is said, instead of "catarrh of the middle ear." This over estimated importance of the tube, and of its condition, as ascertained by auscultation, goes hand in hand with a too slight observation of the changes in the cavity of the tympanum.

Morbid anatomy, however, and an exact examination of the membrana tympani, reveals the frequency of this affection. The above named nomenclature is not confined to general practitioners and specialists of former times; but it may be found, also, in the writings of many late aural surgeons. You will understand, then, gentlemen, that in this manner, which I have just detailed to you, a great deal of catarrhal inflammation, especially the so frequent interstitial thickening processes of the mucous mmbrane of the cavity of the tympanum, are overlooked.

We will see later on, how these cases have been classified as cases of "Nervous Deafness," and how, by this means, nervous affections of the ear have won an undeserved prominence in diagnosis.

* Virchow's Archiv, B. xvi., sec. vii. xxi.

LECTURE XIV.

CHRONIC CATARRH OF THE PHARYNX AS ACCOMPANYING CHRONIC AURAL CATARRH.

The Connection between the Ear and the Pharynx.—Anatomical and Physiological Mode evident by Experiment.—Importance of the Muscles of the Eustachian Tube.—Examination of Cavity of the Mouth.—Rhinoscopy.—A Case of Exudation from the Pharynx.—Symptoms of Chronic Pharyngeal Catarrh.—Nerve Supply of the Pharynx.

GENTLEMEN—You should never omit, in any ear case, to examine the mucous membrane of the nose and mouth. You will find these parts very often affected in chronic aural catarrh. Very often the affection of the ear proceeds from a morbid condition of the naso-pharyngeal cavity being extended from this. Many aural surgeons, almost the greater number of the late writers, deny, almost entirely, this connection between aural and pharyngeal catarrh. I confess, for myself, that I consider it entirely unintelligible, how this connection can be held in question, when a considerable number of intelligent and unprejudiced patients, without being asked, speak of the dependence of the one inflammatory process upon the other, and when also the anatomical facts, physiological laws, and the results of treatment, confirm this view.

Its development, as well as its structure, proves that the mucous membrane of the Eustachian tube is a continuation of that of the pharynx. In its beginning it has exactly the same anatomical characteristics, is thick, puffed out, and has a number of mucous glands, whose entrance we can generally very plainly see with the naked eye. That part of the mucous membrane of the tube which imperceptibly, and without any distinctive borders, merges itself into that of the pharynx, is generally in the same condition with the latter,

and participates in all its congestive and inflammatory condition. Any kind of a noticeable affection of the mucous membrane in the lower section of the tube must, necessarily, in a purely mechanical way, extend with its effects to the higher lying parts of the ear. The contraction of the tube thus caused, a tube which is normally very narrow, and which very readily, especially in the upper portion, entirely closes, will at once shut up the secretion of the cavity of the tympanum, since it cannot be removed as before. Besides, the communication thus cut off between the cavity of the tympanum and the pharynx, and the absorption of the air left in it at the time of the closure, which absorption gradually takes place, will render the pressure on the membrana tympani only that from the external meatus, and thus this membrane, as well as the whole chain of the ossicula auditus, is dragged abnormally inwards.

If, then, the catarrh of the pharyngeal end of the tube always impairs the normal condition of the upper, even if it take no part in the inflammatory process, it is also true that pathological conditions continue themselves on, and we often find a catarrh of the middle ear, at the same time with that of the pharynx. This is proved by examinations on the dead body. On recent subjects, we often find the whole mucous membrane of the middle ear, at the same time with that of the pharynx, in a state of congestive swelling—hyperæmia and hypersecretion. The appearances of the different parts will vary in accordance with the different structure. The part most similar to the pharynx, in the structure of its membrane, is the cartilaginous portion or wall of the tube which is in the vicinity. The covering of the tube, which in the bony portion is thin, pale, and without glands, becomes for a little distance much thicker and more full of vessels, and has also some quite large-sized grape-shaped mucous glands. The symptoms of swelling and hyperæmia are naturally not so evident in the remaining portion of the Eustachian tube, and in the cavity of the tympanum itself, but they can, however, even here be plainly seen in the most of cases.

Daily observation, and experience in practice, show us how all the mucous membranes belong to one system, and that they are almost always in a similar normal and morbid condition.

Johannes Müller says: The mucous membranes, in accordance with their course, have a great tendency to communicate their affections.* We see how often affections of the mucous membrane continue themselves "per continuation." Catarrhal inflammation of the conjunctiva and lachrymal sac occur from a cold in the head, and the inflammation of the buccal cavity, in typhus fever, extends itself through Wharton's duct to the little glandular canal of the parotid; and it is well known how constitutional diseases—I will only name typhus fever, tuberculosis, and the acute exanthemata, extend themselves to the ear.

Thickening of the soft palate works in a purely mechanical way, its size being often increased in chronic pharyngeal catarrh, and thus it presses on the pharyngeal entrance of the canal, and tends to press together the lips at the mouth of the Eustachian tube. Enlarged tonsils have also the same effect in an indirect way (never in a *direct* one), by pushing up the posterior arch of the palate and the soft palate. While we are speaking of the connection between pharyngeal and aural affections, we must remember, finally, that the muscles which move the palate, and assist in swallowing, are also muscles of the Eustachian tube.†

The constant equalization of air between the cavity of the tympanum and the pharynx, is kept up by means of these muscles, especially during the act of swallowing, since they are inserted on the cartilaginous wall of the tube, and affect by their motions the size and shape of the opening. We do not know the mechanism of these muscles any more in detail, but that they do exert an influence on the canal is certain; and we can convince ourselves that such is the case by closing the nose and mouth and swallowing. You will not only then hear an audible sound, but also feel a peculiar fulness in the ear. Thus much is certain: viz. that an abnormal or hindered power of these muscles has an influence upon their mechanism, or effect, and does not allow of a continued normal condition of the parts of the middle ear.

It would be thought that the muscular fibres, which run so

* Hand-Buch der Physiologie. 1844. Vol. 1, p. 651.

† Petro-Salpingo-Staphylinus, or Elevator Palati, and the Spheno-Salpingo-Staphylinus, or Tensor Palati.

near to the surface of the mucous membrane, and which wrap themselves about the glands of the soft palate, would be themselves affected, in a long continued and intense inflammation, and underlie the changes in structure. Although this belief has a certain probability in it, nothing at all can be said with absolute certainty, since the parts have not been examined as to this view. We are obliged then to believe that the pathological changes in the structure of the muscles of the palate, and of the Eustachian tube, have resulted from catarrh of the pharynx. We are able to say with certainty that their functions are disturbed by such a morbid process.

Hypertrophy of the glands of the palate, swelling and thickening of the membrane of the pharynx and Eustachian tube, the most common and sometimes astoundingly excessive consequences of catarrh, certainly increase the task of the muscles in question. Even if the muscles do not increase in size to any extent, as we see is done in the compensatory hypertrophy of the heart, in valvular insufficiency, although from all the facts of the case we have reason to believe the contrary, at least a misproportion between the power possessed and work demanded, will be developed. The muscles of the palate and of the Eustachian tube will not fully perform their duties, will become relatively insufficient. Now then, a normal power of motion of this important apparatus is positively necessary to secure a healthy condition of the middle ear; therefore this insufficiency, which is often caused by a chronic catarrh of the middle ear, will prevent a normal condition of the middle ear.

The great importance of the palatine muscles for the hearing, was first made known by Dieffenbach in his showing that most of the patients with cleft palate were also hard of hearing. In these cases the muscles want a fixation point for their influence upon the Eustachian tube, and consequently it, with the entire middle ear, becomes affected. According to Dieffenbach, the hardness of hearing disappeared, after the closure of the fissure by sutures.

You see, gentlemen, that when we examine the matter more closely, we find a great number of influences and ways, by which affections of the Naso-pharyngeal cavity can continue themselves on the Eustachian tube and cavity of the tympa-

num. Examine, then, in every case of affection of the ear, the mucous membrane of the pharynx, and see in what condition it is. Most persons are not able, when they open the mouth, to hold the tongue down, so that we are compelled to use a tongue depressor. The best to be used are broad and short ones, with a hinge joint, so that one can be used as a handle. Cause the patient to take a deep inspiration, or to articulate a loud "a," the palate muscles will be elevated, and we will be able to see both arches of the palate, the tonsils, and the whole lower portion of the posterior wall of the pharynx. If we are able to press down the whole of the tongue, instead of merely its tip, we can get a deeper view, including the base of the tonsils, and the surroundings, even to the epiglottis, whose upper portion in this manner, in some men, and especially in children, is brought to light. We will see a great many different appearances in such an examination, for there exists a great variety of morbid changes, which take place in these parts. Sometimes the mucous membrane is intensely reddened and swollen, in such a manner that the isthmus faucium becomes extremely narrowed, and the boundaries and borders of the different parts merged together. Sometimes only single parts are affected, as for instance the Uvula, which hangs down as a long and broad sac, or the tonsils are very irregular and fissured in appearance, or the result of many previous abscesses, or they project out with white or yellow points of pus, reaching up to the centre of the soft palate. In adults of more than thirty years, considerable hypertrophy of the tonsils is not so common as general œdema of the mucous membrane ; sometimes there appears, on a slightly red base, a few round elevations, somewhat even and dry, like granulations, as in trachoma, in the stage of diffuse inflammation or in blennorrhœa of the conjunctiva. The mucous membrane lying between has even sometimes a strikingly pale and flabby appearance, and sometimes, on the contrary, appears dense and tense, as if shrinking had occurred. Large patches of œdema show themselves symmetrically on both sides of the pharynx, behind the palato-pharyngeal arch.

In other cases, the mucous membrane, as far as we can follow it, appears strikingly pale, shining and thin, only traversed by single varicose veins, and the thin, long, and flabby uvula hangs down like a needle. Irregularity in the arch of the soft

palate, is less common in acute than in chronic affections of the pharynx; however, we often see the uvula pushed more or less obliquely to one side, without any paralysis of the facialis.

Very often the space between the two arches of the palate is very large, without being filled up with a tonsil, and the posterior wall of the pharynx is much nearer; so that the entrance into the naso-pharyngeal cavity is much narrowed.

The latter named appearance seems to indicate a thickening of the soft palate, that is, of the broad part bordering on the fauces. We can assure ourselves of an irregular tumor like alteration in the arch of the soft palate, by means of a catheter introduced through the nose, and moved about in this region, which will give, by means of a peculiar doughy feel, the idea of a diffuse œdema of the upper pharyngeal space. We may often draw out, by means of the catheter, great masses of half-dry green mucus, such as are often visible on opening the mouth, lying in drops on the posterior pharyngeal wall, or firmly incrusted there.

Until recently, we have been unable to examine the upper pharyngeal, or nasal pharyngeal cavity, in which the so important pharyngeal opening of the Eustachian tube lies, except in those rare instances in which there was a fissure of the palate, or a considerable defect in the structure of the nasal meatus.* *J. Czermak*, to whose talent and zeal we are indebted for making *practical* the examination of the larynx with the laryngoscope, and causing it to be a developed branch of science, promulgated the simple as well as the good idea of placing the mirror in an upward direction, and thus obtain a view of the nasal cavity. This method of examination has been called Rhinoscopy, or, in later times, Pharyngoscopy. We use also the little mirrors as in laryngoscopy, and we generally have only another inclination to give the handle in order to their use. We need, also, a tongue spatula, for which the jointed one, already mentioned, is the best—the patient being able to hold it himself; then we may also need, in some cases, a broad hook for lifting up the uvula. When we have no sunlight for illuminating the part, which is best adapted for the purpose,

* Gazette Méd. de Paris. 1857. Number 19.

I use an Argand's study-lamp, over which is an illuminating lantern (Levin's), by means of which the light is retained, and transmitted through a strong convex lens. We can either allow the light to fall directly on the pharynx, or turn it upon it by means of Semeleder's illuminating spectacles. This consists of a strong spectacle frame, on which, by means of a joint, a concave lens is fastened. In spite of all these appliances, rhinoscopy is yet by no means an easy matter; and to be able to see what is to be seen, only comes after long practice. The parts to be seen are posterior surface of the palate, nasal openings, with the ends of the inferior and middle nasal muscles, pharyngeal opening of the Eustachian trumpet and its vicinity, the portion corresponding to the base of the skull, and finally the posterior pharyngeal wall.

There is a great sensitiveness of the pharynx, so that its muscles contract spasmodically at every touch, or a tendency to vomiting occurs, with great constriction of the entrance to the throat, all of which are hindrances which not only render the examination difficult, but sometimes even prevent a thorough examination. This state of things is quite often present in just the patients who have affections of the ear. However, as the surgeon becomes more skilful through practice, these cases become more rare.

The upper pharyngeal space is rarely examined with any exact anatomical view; therefore, its normal as well as pathological condition is generally not well enough studied and understood. It is a part so hidden and off the way, that in ordinary post mortem sections it is rarely brought into view.

(On page 393 of the second volume of the American Medical Times, will be found an interesting communication from Dr. J. Simrock, of this city, with an engraving of a modified pharyngoscope.

Dr. Simrock is one of the few gentlemen in New York, who practise pharyngoscopy; and I think he would confer a great benefit on the profession by making known the results of his observations.

You should prepare for yourselves sections of the head, or take from fresh subjects the two temporal bones, or its petrous portions, by means of two saw-cuts, one passing through the mastoid process, the other through the zygomatic process of

the malar bone, and you will be at once surprised at the uncommon richness of the parts in vessels, at the succulence and thickness of a mucous membrane, which many physicians have never seen in their whole lives. You will be surprised, when examining this part, to find it the origin of many of the diseases of your patients. You will not examine many heads without finding some abnormal appearances in the parts. The most common appearance is hypertrophy of the glands, especially in the palatine arch, where it may be so great that this is three or four times its usual thickness; then, also, swelling and hyperæmia of the whole mucous membrane, which last may lead to greater or smaller extravasations under the epithelium, or on the surface itself. Bloody sputa no doubt comes much more commonly from the upper cavity of the pharynx than is generally believed. How often hæmorrhages occur under the membrane of the pharynx and in the glands, the fresh evidences of blood show, as well as its remains, the black pigment, which is so often found in the vicinity of the Eustachian tube, and mingled with the pharynx sputa. In order to convince one's self of the degree of development of the grape-shaped mucous glands of the wall of the pharynx, we have only to prepare a piece of its membrane and hold it up to the window and look through it. The peculiar protuberant bodies on the nasal openings are very often, also, hypertrophied. In chronic pharyngeal catarrh, the trumpet-shaped mouth of the canal is sometimes strikingly wide, its lips standing unusually wide from each other. We are able to press white, glairy mucus from the glands, and we sometimes thus uncover white and brown calcareous concretions of various sizes, and sac-shaped, which are firmly buried in the tissue.

Superficial round loss of substance is seen more often than deeper ulcerations, such as obtain in syphilis and tuberculosis, exactly in the vicinity of the mouth of the Eustachian tube.

We find folds or pockets and bands of tissue into which the catheter may easily pass in the fossa just behind the mouth of the tube (Rosenmüller's fossa). Just here, where, according to Kölliker, great masses of mucous glands are congregated, being similar to the structure of the tonsils, and which are generally enlarged in old persons, and filled with masses similar to pus, I found in an ear patient, who had suffered nine-

teen years from asthma, a somewhat prominent swelling about the size of a cherry, which, on being incised, showed contents of a whitish yellow appearance.* In a post-mortem section of a person who had been deaf and dumb, thirty-five years old, I found at the same point a similar but far larger swelling filled with a thick, yellow, brownish mass, which consisted of mucus and crystals of cholesterine. Near the swelling, and extending to it, were several little cysts, filled with glairy mucus. Such cystoid structures are, perhaps, degenerated mucous glands, and are often found in the throat. At least, I have already often observed that a patient, immediately after the use of the catheter, ejected such masses of puriform or mucous secretion, so that the patient would himself describe it as a "sac full of mucus," which had been pushed into by the catheter.

In one case the ejection of such sputa alarmed me for a time not a little, since in its outward appearance, as well as the mingling of blood and mucus in the interior, it looked like pneumonic sputa. The patient—an old gentleman—expectorated a great quantity, in the afternoon and morning, after the catheter was used. When he showed me two handkerchiefs full of it, my first thought was of pneumonia. The patient relieved me of my fears, by breaking out in the voice of a Stentor: "You think there is something the matter with my lungs. In the year 1848, I was first president of the House of Commons, then my chest proved its capabilities, and to-day, I went again on the tribune, to cry down the noise." At that time we had the good fortune to have here the first authority in sputa, Biermer, so I sent the patient to him, in order that he might examine the sputa. At first it seemed to Biermer that it was pneumonic, but he found the chest perfectly sound; and after a thorough examination, he decided that the sputa, which had alarmed me so much, must have come from the nose or fauces. Probably it came from some kind of a cyst, or mucous gland in the pharynx, which emptied its contents after the use of the catheter. I do not know that a similar case has been previously observed.

According to Semeleder,† pharyngeal polypi appear to grow very often from the base of the skull.

* Virchow's Archives, volume 18, page 78.

† Zeitschrift der Wiener Aerzte. 1860. Number 47.

Rhinoscopy will enable us to detect the above-named and other morbid appearances during life. As new and unemployed as this method of examination is, it has already furnished us with many interesting details of the pathology of the naso-pharyngeal cavity, and will certainly yet win a great importance for the morbid anatomy of the pharynx as well as of the ear.

The symptoms of chronic catarrh of the pharynx are very different in different cases. Often, even in the most intense form, the patient has no idea that he has any affection of the throat. He will, however, just remember, on close questioning, that for years, especially in the morning, he has expectorated considerable quantities of mucus. Others speak of a certain dryness or an unpleasant tickling in the throat, which is very annoying and demands the frequent use of cold fluids, or moistening with bon-bons, or the like. Others complain of a certain difficulty of swallowing, after even the slightest cold, and of variously severe pains accompanying it. With these complaints, you will also hear of a great annoyance from the constant accumulation of mucus, requiring some considerable trouble to remove it from the throat; and the muscles, thus frequently called into service, may be at length forced into morbid action, and vomiting be produced. This unpleasant symptom occurs generally in the morning just after getting up. As a consequence of the head being on a vertical line with the body during sleep, and the long inaction of the muscles of the throat, a considerable quantity of mucus is collected; this becomes dry and dense, and adheres quite firmly to the membrane. Thus is explained how all the symptoms of catarrh of the pharynx are most common in the morning, and are the more prominent the longer the patient has slept, the worse the air which he has breathed during the night, and the more he has exposed himself on the evening before—that is, smoked and drank. Besides the dryness of the mouth, which is occasioned in such patients by the "cold in the head," and the necessity of sleeping with the mouth opened, which is caused by nasal catarrh, the patients feel also a heaviness in the head and fullness in the ears. These symptoms will be relieved when they have gargled the mouth, and taken a glass of water or cup of coffee, after which the mucus is loosened

and easily removed. In some patients, however, the increased ejection of sputa continues during the whole forenoon. A patient of this class, who seemed to be a person of temperate habits, assured me that these unpleasant symptoms disappeared when he held a small quantity of brandy in his throat for a short time, which, he said, "cleared his wind-pipe."

We meet with gastric symptoms quite often in connection with chronic catarrh of the pharynx; symptoms which somewhat resemble those of a mild chronic catarrh of the stomach, and which must result from the connection of the mucous membrane of the pharynx with that of the stomach. The secretion of the pharynx is sometimes so excessive, as to be almost a pharyngeal blennorrhœa, and the whole of the mucus cannot be ejected; and perhaps it may pass down into the œsophagus. Although we know very little of the chemical constitution of the sputa of the pharynx, yet we may believe that the stomach will not tolerate it in any great quantity. Furthermore, many observations have convinced me that many forms of the so common NEURALGIA which occur in chronic catarrh, and which generally appears as pains in the forehead and back of the head, are closely connected with this affection. In order to convince you of the possibility of such being the case, I have only to call to your mind the many headaches which depend on affections of far-removed organs. How very often pain in the head is one of the symptoms of diseases of the eye, stomach, kidneys, and very often of the uterus; and we are only able to cure the disease by reaching the cause. Then, the palate and pharynx are parts very rich in nervous supply, and many nerve branches take part in the supply of these parts.

Thus, the trigeminus furnishes motory as well as sensory fibres; the motory from the pterygoideus internus, of the third branch, and the sensory as well from the second as the third branch. Further, the spheno-palatine ganglion communicates with pharyngeal branches, and with the palatini descendentes, and the otic ganglion with branches *ad tensorem palati mollis*. Furthermore, we should mention the facialis which, according to the most of authors, furnishes a small branch to the soft palate; the glosso-pharyngeus from which, as is well known, a great part of the motory as well as sensory power

of the throat and palate is obtained; then the pneumogastric, which gives two branches to the mucous membrane and muscles of the pharynx.

As the branches of the pneumogastric and the glossopharyngeus have a reflex action on the pharynx, so also a plexus pharyngeus is formed from the sympathetic.

Few parts of the human organism have such a rich nervous supply and free connection.

Now, then, is it probable or not, that parts thus connected to other organs, when morbidly affected, only make it known by local symptoms, or should we not conclude *à priori*, that these same morbid affections must affect other near channels and other organs? If we will but once examine the affections of the pharynx more closely, instead of thinking them worthy of no attention, we shall discover facts which have an importance for the whole organism, and whose effects on the various parts are more considerable than those I have indicated.

It remains still to be said, that the affections of the upper and lower portions of the pharynx often produce a bad odor from the mouth and nose. Sometimes we perceive this at a considerable distance, so soon as the patient breathes with his mouth open; more commonly we perceive it first, when making an examination. It has something of the odor of stinking cheese, and is generally unspeakably sickening and uncomfortable for the surgeon, if he is at all sensitive to odors.

LECTURE XV.

SIMPLE CHRONIC AURAL CATARRH (CONTINUED).

Chronic Nasal Catarrh. — Participation therein of the Mastoid Cells, and the Eustachian Tube. — Prognosis of the various forms of Catarrhal Inflammation.

GENTLEMEN—We have now a few words to say of the chronic catarrh of the mucous membrane of the nose, which is very often connected with that of the ear and the pharynx.

The fœtid odor of catarrh, spoken of in our last lecture, may be a characteristic, not only of Ozœna, but also of other affections. We may find it in females during the menstrual period. The patients themselves do not appear to be generally aware of the odor.

The secretion is seldom increased in nasal catarrh, of which we are now about to speak, but generally decreased. The patients find themselves with their head "stopped," or "stuffed up;" the nose is very dry, not requiring the use of a handkerchief; they complain of a feeling of stoppage and thickness in the nose, and the air passes less readily through it, on account of the thickness of the mucous membrane. If the secretion has been for a long time very abundant, we must examine as to polypous growths, which are sometimes found on careful examination, when the patient and physician have had no idea of their existence. Nasal polypi are very often overlooked, when they are not so large as to be pushed against the external meatus by a strong expiration, or when the permeability of the affected side is not fully impaired. It is possible that such have their origin in the antrum Highmorii. Luschka and Giraldès* have, at least, proved that cysts and peculiar polypoid mucous growths appear on this part. Luschka found in sixty sections five soft polypi in the antrum.

* Virchow's Archives. Volumes 8 and 9.

We are sometimes, also, able to recognize inflammatory affections of the antrum on the living subject; such patients speak of indescribable feelings of heaviness, and pressure in the molar region, which often increases to painful irritation and toothache; as you know, the superior dental nerves run immediately under the antrum, so that they are easily subject to swelling on any pressure of this part. We often see yellow masses of mucus collected in such cases, and I am inclined to think that they have their origin in this neighboring cavity to the nose. We can introduce an ear-speculum, for the examination of the nasal cavity, and illuminate it by means of the concave mirror. The valvular speculum may be used with advantage, the nasal cavity having flexible walls. The anterior portion of the alæ of the nose is often so enormously thickened, that it may be mistaken for a polypus growth.

We remarked, in the beginning of our observations on the subject of chronic aural catarrh, that it consisted in repeated swelling and gradual thickening of the mucous membrane of the middle ear, which process was generally accompanied by severe congestion, and increased sensation on this surface. While I spoke of the subjective and objective symptoms, through which this state of things might be recognized, we have not attempted to separate the different parts of the ear, in the effects made upon them by the disease. We have now to consider how far we can localize these effects; what part do the mastoid process and Eustachian tube take in these affections; of what importance are the morbid changes taking place in them?

The number and extent of the air-cells, the opposite conditions of density and porosity, are so various in the mastoid process, that in persons of the same age, sometimes one, sometimes the other, is more prominent; and with our present knowledge, we are not always in a condition, in a given case, to say if the appearances in the mastoid process should be characterized as morbid or physiological. In some cases of thickening of the mucous membrane of the cavity of the tympanum of one ear, I found the mastoid process of the same side, with strikingly small cells, more solid in structure, while on the other the air-cells were very large. It cannot, certainly, be decided, if such a kind of difference in cell

development proceeds from chronic aural catarrh. However, there is a very great probability, when the middle ear has been for a very long time in a condition of congestion and hyperæmia, that the space-holding air gradually begins to enlarge by means of increased secretive power, and also, through increased formation of bone, a hyperostotic power, which is often seen in all parts of the body, ends in chronic inflammation of the periosteum. How far such an increase in density of the mastoid process affects the other parts, and how much it injures the hearing, we do not know, since no observations have been made on this subject; and moreover, we have no facts as to the greater or lesser capability of the mastoid cells for containing air during life. It is probable, that we may obtain some light by auscultation of the ear, and percussion of the bone, and by ascertaining the degree of hearing-power, by placing the watch over the mastoid process, as compared with other results. It is, however, as yet advisable to simply consider all these observations without being in haste to draw conclusions from them. Let us turn to the consideration of the physiological importance of the mastoid process, in order to determine what results must obtain from the described altered condition of the air-containing power of these cells. It is a generally accepted opinion, that the purpose of these air-cells—this porous structure—is to give to this firm covering, or guard to the ear, a certain lightness. But there must be some further purpose than this.

The air-cells of the mastoid process increase the quantity of air which is set in motion by means of the acoustic vibrations; they are, with every circumscribed fixed body, and every circumscribed quantity of air in the vicinity of the labyrinth, to be compared to a resonator, or sounding-board. We cannot say how far any diminution in size of these parts places the hearing below normal. It is possible that each transient deadening, each hollowness of the patient's own voice, which is often complained of during a catarrhal condition, is a symptom of diminished resonance, through a filling of these cells with secretion.

This hollow space in the vicinity of the cavity of the tympanum, has also a greater importance, in that it is a sort

of air reservoir, by means of which all sudden changes in the cavity of the tympanum, as to the quantity of the air, may be equalized, and thus rendered less effective. We saw previously how in simple swallowing, with the mouth and nose closed, that the air was considerably rarefied, and the membrana tympani pressed inward, as we can determine by examination with Politzer's air-measurer. This same state of things occurs also in a strong respiratory action, as, for instance, in sneezing, spasmodic coughing, or violent blowing of the nose.

We know, to reverse the case, how a strong condensing of the air, in the middle ear, with pushing out of the membrana tympani, can be noticed, as for instance, when air is pressed from the lungs into the ear.

Again, if a sudden increase in the pressure of the air occurs, as for instance, from a very loud report, such as cannon, or trumpet, sound takes place near the ear. Think, gentlemen, what an effect would be produced from such a change in the pressure of the air upon the small quantities in the cavity of the tympanum, and in the other parts of the middle ear; how easily must a solution of continuity occur. Either a laceration of the membrana tympani, of the membrane of the fenestra rotunda, a pushing of the stapes into the vestibule, or a separation of the extremely delicate articulation between the incus and stapes, or any other, according to the kind, force, and structure of the powerful movement of the air. All these accidents will be less likely to happen, when the pressure of the air is more equally divided by having access to the various spaces.

When the membrana tympani is lacerated in the course of an otitis, it almost always occurs at the moment of a strong expiration, as, for instance, when the patient sneezes. Such an effect from sneezing is rendered possible from the fact, that in a purulent otitis, the cells of the mastoid process are filled with secretion, and there is a hyperæmia of its integument; while even when there is a complete solidifying of this part of the temporal bone, there are still, immediately behind the cavity of the tympanum, certain hollow spaces still unfilled, and in a condition for containing air. It seems to me, that a perforation of the membrana tympani, during an inflammatory

process, more commonly proceeded from the above-mentioned cause than from a pressure of the secretion against the thin membrane. And the following fact goes to sustain the opinion—that is, that we generally find a fine long perforation, not a round hole, as would proceed from the gradual bursting of an abscess, whose covering had been for some time under pressure and tension.

We pass on now to the Eustachian tube, and we have already seen that the physiological duty of the tube is a double one. It has at once to transmit the secretion of the cavity of the tympanum downwards, in which the motion of its epithelium sensibly assists, and then to keep the air in the cavity of the tympanum and in the cells of the mastoid process in equal proportion with that without. We have seen, furthermore, that the muscles of the tube have a considerable share in the performance of this duty, and that they cannot do their work properly when they are "insufficient."

This insufficience can be absolute, from degeneration of their structure, or paralysis of their nerve supply—the fifth pair—or from what often exists when the muscles are otherwise in a perfect condition, inability to perform their functions on account of increase of mucous or glandular secretion of the tube. The middle ear can only be in an entirely normal condition when there is no interference with the functions of its mucous membrane and muscles; and *vice versa*, each abnormal condition of the Eustachian tube must have an effect on the cavity of the tympanum. I cannot speak often enough of the dependence of these parts, the one upon the other; and I must so much the more attempt to impress its great importance upon you, and attempt to make it clear, since it plays such a part, in our view, in aural catarrh, while an opposite view is taken by the most of authors.

Generally, all the parts of the middle ear are attacked simultaneously with catarrh, which leaves tracks of its presence in the cavity of the tympanum, and on the internal surface of the membrana tympani. In some cases, however, it is localized in the Eustachian tube, and confined entirely to its membrane.

As we have said before, this catarrh of the Eustachian tube must greatly affect the cavity of the tympanum, even when

the mucous membrane of the cavity does not participate in the morbid changes of that tube. The retained secretion of the middle ear is of minor importance, since in a normal condition it is very small in quantity. The interference of the exchange of air between the cavity of the tympanum and the pharynx is of much more importance, for the air already in the cavity will gradually be absorbed, and thus pressure only remain on the external surface of the membrana tympani; this will become more and more pressed inward, and with this the ossicula auditus, as is shown by the ingenious experiment of Politzer, and thus a pressure on the labyrinth is made. If you will swallow repeatedly, with your mouth and nose closed, you will experience an uncomfortable feeling of fullness in the head, accompanied by deafness and noises in the ear. In a similar manner, though less marked on account of the gradual approach to this state of things, the closure of the tube will manifest itself, and it is known that these symptoms appear with each severe cold. If the swelling should remain but for a short time, then the hearing will be restored in its integrity. So soon as the equality in the pressure of the air has been restored in front of and behind the membrana tympani, as often suddenly occurs in sneezing, yawning, or blowing the nose, the patient will then hear as well as ever, is freed from the unpleasant feeling of fullness, pressure, and noises in the ear.

On the contrary, if the closure of the Eustachian tube has lasted for months and years, if the membrana tympani has been for a long time pressed inward, and the stapes against the vestibule, and thus a pressure exerted for the whole time against the tender structure of the labyrinth, while the two muscles, tensor tympani and stapedius, are not in a normal condition, while all these things have occurred, changes of structure will have developed, which do not disappear, even if the causes are removed.

The most characteristic symptom of this described condition of things is, that the membrana tympani is pressed regularly inwards and is everywhere, over its whole surface, concave, the color and density altered, although, as to the latter, it makes the impression of being thinned and atrophied, and the articulation of the incus is plainly visible. If the patient

presses air into the ear, or we blow in with the catheter, we will see the membrane go outward with considerable power, and then sink back again to its previous position. *Wilde* calls this condition "collapsed membrana tympani." This collapse is, however, less often a result of primary weakness, a self-originating atrophy of the fibrinous portion of the membrana tympani, than a consequence of long-continued, one-sided pressure exerted on the outer surface of the membrane, and thus, in the course of time, its equable condition has been altered; whereby, as it seems to me, a thinning and atrophy of its fibrous structure has occurred. It is doubtless true, that such a state of things is also brought about and encouraged by abnormal adhesions of the membrana tympani, and by peripheral thickening of its mucous membrane.

When, then, we meet with such a collapsed condition of the membrana tympani, we must consider all the possible modes of its origin. It can depend on any of the previously-named causes, viz. long-continued closure of the Eustachian tube, change of structure in the membrane itself on the formation of abnormal bands of adhesion.

The cases where the catarrh plays a more independent part, and remains the concentrated point of the disease, are very probably the least common. Generally, the catarrhal symptoms in the middle ear, if not the first in point of time, are the most important as regards the permanent affection of the hearing; and if there be a swelling of the membrane of the Eustachian tube accompanying it, it is merely a coincidence on which, probably, depend the vacillating symptoms of the patient. Every one's Eustachian tube is more permeable in dry weather, and less so in moist.

This slight swelling of the mucous membrane, which produces no symptom in a healthy individual, has, however, a disturbing effect on the ears of a person who has suffered for a long time from a chronic inflammation of this part, and whose Eustachian tube entrance is, consequently, very small. Therefore, it is well for such patients to press daily upon the ear, and thus assist in preventing complete closure from taking place. If we speak of chronic aural catarrh as "catarrh of the Eustachian tube," we ascribe too great

an importance and independence to the tube and its affections. The principal interference with the hearing depends chiefly on the localization of the affection in the middle ear, and on the wall of the labyrinth on the two fenestræ. If we except the closure of the tube, which plays an important part, its affections are of quite transient importance.

Prognosis of Chronic Aural Catarrh.—This is so far good, as we can reach the seat of affection, and act on the mucous membrane of the middle ear, by means of the catheter. But we see these favorable appearances only in two directions. We know, that in general we have no radical treatment for catarrhal processes in other mucous membranes than that we are now dealing with, and remains or residue processes are very common. Only too often there forms in persons who have at one time suffered from aural catarrh a *locus minoris resistentiæ;* and thus, every cold, every slight cause of disease, has an effect on this part. There are some persons who need a continuous treatment, only to get rid of *residues* of these permanent affections. Another unfavorable circumstance for the prognosis is, that the subjective symptoms are so few, the course of the disease so insidious, and the deafness appearing so unnoticed and slowly, that the greater number of patients notice it first after some degree has existed for a long time—it may be for a term of years. How much or how little can we do for a case of old and deeply-rooted catarrh?

You must know, gentlemen, that here, the case is about the same as with ancient affections of other organs. We can do about as much for the ear, under these circumstances, as for any other part. The older the patient, the longer existing has been the affection, and the more morbid changes in structure have taken place in the cavity of the tympanum, the less will we be able to do for our patients. However, in many cases of long standing, which seem to look unfavorable, much may be won by a long-continued local treatment. We must expect very little from our art, and be contented if we can check a process, and leave a certain amount of hearing, which, without interference, would have gone on to total deafness. Do not esteem this little too lightly, gentlemen, for it is something, when a patient, already suffering

from ten to twenty years' deafness, which, without medical aid, would have gone on to complete loss of hearing, is re strained, and enough hearing left for the duties of life, even if with some inconvenience.

Consider for a moment what the physician is able to do in other intensive affections of mucous membrane, although, for many years, the field of science in which he is working may have rejoiced in properly directed labor, and it may be an affection in which the patient seeks medical aid very early. Do you entertain a very sanguine hope for a patient who has suffered for a very long time from a declared catarrh of the lungs or of the bladder? Do you not consider yourself fortunate when you have maintained the "status in quo?" and will you not, even with the utmost care, often be unable to prevent the progress of the disease? Aural catarrh does not belong to the worst forms of disease as to prognosis, because, as a rule, we are able to check the progress of the affection. In more recent cases, we are able to say, that the condition can be greatly improved, and the prognosis, in general, would be altered, if the patients came to us earlier. In order that the condition of things may be changed, you, gentlemen, must do your part; for, added to the few subjective symptoms which are excited by chronic catarrh, there is a want of intelligence among the people, and a want of physicians whom the people can trust in aural affections. Thus it is, that the affections are developed to an irremediable degree. If the public but learns that diseases of the ear, like other affections, may be cured in their beginning, but that the probability of improvement diminishes as the disease advances, and when the time comes when there are surgeons enough who know how to examine and treat a patient with aural affection, then the prognosis of chronic catarrh of the ear will be entirely different from what it now is.

If you wish to make distinctions, as to prognosis, in the different forms of aural catarrh, then, I would say, that my experience teaches me that the most unfavorable are those where the changes in the membrana tympani are diffused over the whole surface, and it is regularly thick, without any change in color. In such cases, when year-long, slowly

developing thickening of the mucous membrane of the cavity of the tympanum, is indicated; where a kind of sclerosis has occurred, we will be fortunate, if we succeed so far as to diminish the Tinnitus aurium. If, however, there be a partial and circumscribed alteration in this membrane, especially of the adhesive variety, and the membrane appears more of a white color, then the prognosis is often better than the other circumstances, age, and general condition of the patient would lead us to infer. The more, in general, the abnormal condition of the parts can be improved by the mechanical effects of the air-bath, the less morbid changes have taken place on the fenestra ovalis and rotunda, and the more prominent in the foreground is the morbid condition of the Eustachian tube, the better will be the prognosis. In synechia of a high grade of development, which has gone on to an almost complete obliteration of the cavity of the tympanum, I have scarcely ever seen any improvement. A very unsatisfactory prognosis will also be made, when, with deafness, there also exist calcareous formations on the membrana tympani. Patients who, although they have a great loss of hearing, have not been affected long, who are getting worse, have a better prospect for treatment than those who, for years, have remained at about the same point. You should be guarded, however, in the first-named cases, in saying *how much* you can improve the condition. We can never say what extension of the morbid process has been made upon the contents of the cavity of the tympanum, and how much the labyrinth has taken part in the process.

Some cases, and just those which are improved by a simple filling of the middle ear with air, have so far an unfavorable prognosis, in that they require the constant continuation of this practice. Such patients should be taught to use the catheter themselves, in order always to be in a condition to blow in air, or allow others to do it.

LECTURE XVI.

TREATMENT OF CHRONIC CATARRH.

Local Treatment.—Air-Bath.—Steam.—Mechanical Methods of Dilatation.— Treatment of the Mucous Membrane of the Pharynx. — Cauterization. — Gargling, and its Mechanical Importance.—Excision of the Tonsils.— Observation of Patient's General Condition.

GENTLEMEN — Since we have studied the nature of aural catarrh, in all its variations, we will close the subject to-day with some remarks on the Treatment.

This must consist in a correction of the altered condition of the mucous membrane, and an attention to the general health of the patient. The strictly local treatment can only be practised by means of the catheter.

There are cases, and these especially occur in young people and children, when it is sufficient to set in motion the irritating mucus in the Eustachian tube and cavity of the tympanum, bringing the two surfaces of the tube away from each other, and thus render the free interchange of air possible between the cavity of the tympanum and pharynx. This purely mechanical effect of the air-bath is necessary in all cases in the beginning. But, further than this, we must attempt to affect the diseased membrane, and seek to change its morbid condition. This will be done chiefly by the vapor of water injected into the middle ear. So long as there are increased rattling sounds during the air-bath, and we believe there is an increased secretion, and a moist swelling of the whole mucous membrane, the fumes of muriate of ammonia will be of especial benefit; their use being now practised with success in affections of the larynx and trachea. The pain caused differs very much in different persons; some only feel an unpleasant warmth, others a sense of smarting: gene-

rally, however, there are only pains of very short duration, partly in the ear, partly in the throat. If the patient says he only feels the vapor in his throat, we need not always conclude that it has not passed into the ear. The otoscope, and the subsequent examinations of the membrana tympani, where the vessels on the handle of the malleus are generally injected, after the application of the chloride of ammonium, tell, generally, a plainer and more correct story than the patient. We take uncrystallized ammonium muriaticum depuratum, and allow only a small stream of air to pass gently, filling the pump, and opening the faucet only halfway, so that the salt shall not enter in great masses, but in an infinitely minute, sublimated condition. How long each sitting should be, if each ear should be acted upon, cannot be answered except by referring to each individual case, after the first effect of the vapor is seen. Generally, the secretion is soon checked, the impermeability of the tube is removed, and a fuller and stronger stream of air passes into the ear. In older cases, the ammonia serves only as a preparatory remedy, by means of which a further treatment is rendered possible, and that is by the means of the vapor of water-steam,—which must be used for weeks, and sometimes for months.

Moist warmth is the most powerful softening agent and aid to resorption ; and the warm vapors are of great importance in treating the thickenings of the mucous membrane of the middle ear. We choose a high or low temperature for the vapor according to circumstances ; I generally use from 35° to 45° Reaumer (Fahrenheit 110° to 133°). The warmer it is applied, the oftener we must allow pauses during its application, in order that the silver of the catheter is not too much warmed, and an unpleasant burning in the nose be caused. The mouth of the catheter is mostly felt in the nasal entrance, and I take care, in cases where I must use a high degree of heat, say 50° to 60° R., or where the patient is peculiarly sensitive, to guard the part by means of a piece of gutta percha, which is drawn around the catheter. The effect of the warmth is very much less marked in the pharyngeal entrance to the tube and in the cavity of the tympanum itself. The time of a sitting, during which the vapor is

partly drawn in with an interrupted, partly with a continuous, stream, is from five to ten minutes, and still longer. In many cases we are obliged to go back from vapor of water to that of muriate of ammonia, as we cannot always exactly say when any given case will be better affected by one or the other.

I have made various experiments, in chronic cases, with different kinds of vapors; and when I, perhaps, except iodine and acetic ether, I must choose vapor of water as the best. Among the preparations which I have used, are, besides the various ethers, sulphuric and nitric, chloroform, acetic acid, aceton, one of the products of the dry distillation of wood, acidum pyrolignosum, ol. terebinth., narcotic extracts, and all without any especial use.

We should not cease, however, to attempt to find new remedies, some one or other of which may be of great use in a particular case, and the effects of remedies on a mucous membrane can only be made known through a series of observations.

I should speak of the vapor of carbonate of ammonia as another of the remedies which I have used, which is more irritating than the muriate, and of calomel, of which this is also true; of camphor, which has an almost indifferent effect; of gases, I have used carbonic acid: we can use this mixed with atmospheric air, or warm vapor of water.

We have already seen, that all these applications must be made with a certain *vis a tergo;* that a compression pump, or the like, must be used if we would be certain that the air passes not only into the lower part of the tube, but also into the cavity of the tympanum itself. It is always advisable to occasionally introduce an otoscope during the use of the catheter, in order to assure ourselves that the instrument has not been displaced. This precaution is doubly necessary, when we cannot fully rely on the intelligence of the patient who is holding the catheter.

You will naturally find, that after the use of warm vapors, to which, perhaps, an irritating remedy, for instance tinct. iodine, is added, that considerable fullness of the vessels occurs in the mucous membrane, and that the patients will hear worse, the head is fuller, and they complain more of fullness

in the ear, and noises in the head; I would much prefer that this hyperæmia should occur than that there should be *no* results, after such severe medication. If the artificially excited swelling of the membrane should affect the permeability of the tube, and the condition of the pharynx, which sometimes very unpleasantly occurs, we must use the simple vapor of warm water for a few days, with the simple air-bath, or muriate of ammonia, and direct the patient to press in air several times a day, by closing the mouth and nose, and making a strong expiratory effort; and we should convince ourselves, before each application of the steam, of the permeability of the tube, by using the simple air-bath. From the above-named reason, we are seldom able to use acetic acid, which, otherwise, would be of great use.

Having been convinced, from repeated observations, that people who have suffered for years from deafness, consequent upon chronic catarrh, have been improved from an attack of acute inflammation, I have sometimes endeavored to produce an acute artificial one. I have used for this purpose quite severe irritants, pure tincture iodine, concentrated acetic acid, which I forced into the cavity of the tympanum in a full stream. The pain and other symptoms of irritation were quite considerable, without my being able to see any results to the hearing.

If we will now consider the condition which we find in the dead subject in chronic aural catarrh, we may learn from that what we may expect from our treatment.

When, unfortunately, the whole canal leading to the membrane of the fenestra rotunda, is filled with a plug of connective tissue, as I have found it, and described in my sections, or this membrane is changed to a thick, inelastic one, or to a calcareous plate, does it not indicate an operative procedure? I am persuaded, that even in aural surgery, a wider field will be opened to operative experience. It is not yet time, in the present condition of this department of science, for the introduction of such ideas, and each step forward must be assured us by experiments on animals and on the dead body. No where is there so much humbug practised, and unscientific attempts made, as in this department; and no where, both from lay and professional public, is medical treatment received

with so much distrust. Whoever wishes to speak of the subject fairly, must admit this.

Before we leave the subject of chronic aural catarrh, we have still to speak of mechanical dilatation. In cases where, after repeated air-baths, and also the use of the vapor of the muriate of ammonia, only a very weak stream of air passes into the ear, and that only with the aid of the act of swallowing, and when the narrowing of the tube does not depend on the swelling of the mucous membrane, but on an organized hypertrophy of connective tissue, there is nothing remaining but the use of a sound of whalebone, or catgut. This must be in the shape of a blunt cone, and of the length of the catheter, with that of the tube added. It is well to use a catheter with a large angle of curvature, and to press it as much as possible on the nasal septum, so that the sound, protected by it, will be less likely to pass into the throat. So soon as the middle of the canal is reached, the patient will speak of a sharp pain in the ear, and when the sound comes to the last third in the change from bony to cartilaginous canal, where the passage is the narrowest, and where changes most often occur, the local pain is increased, and may extend to the teeth above and below. One patient spoke always of a severe pain in the back part of his head. If the sound will not pass further, withdraw it, and by repeated attempts try to get it in the opening. The very plain movement of the sound, in the moment when the patient makes the motion of swallowing, is very interesting. In most cases, after its withdrawal, the catgut, if it has lain for some time in the canal, will afford us a clear view of its peculiar spiral course, varying in different individuals; sometimes it may be observed behind the membrana tympani.

The narrowest portion of the Eustachian tube, *isthmus tubæ*, has only a width of scarcely one millimetre; therefore, we cannot use a sound which is any thicker. The whalebone sounds can be made of various thicknesses; of course we begin with the thinnest, and increase gradually. I have, as yet, never seen any emphysema of the cervical region resulting from this sounding. In order, if possible, to avoid any such result, I forbid the patient from passing in any air for an hour after. After a few passages of the instrument, the stream

of air and sound pass much more freely. *Rau* recommends sounds, dipped in solutions of nitrate of silver, and dried, in order to unite cauterization with dilatation. On the whole, this dilatation of the tube is not often necessary, but there are cases in which we cannot get on without it.

I have sometimes succeeded with whalebone, when with catgut I did not. I have seen no results from medications applied to the external auditory canal, and on the external surface of the membrana tympani, or from a stream of carbonic acid gas, so often recommended at our springs, to be passed upon the ear, in chronic aural catarrh. Since *Toynbee* recommends the penciling the external meatus with a strong, and the membrana tympani with a weak solution of nitrate of silver, I considered it my duty to give it a fair trial. I have, as yet, seen no other result than that the penciled portion became black. As an adjuvant, we can paint behind the ear, with tinc. iodine, or use the iodine in the form of a salve. (In all chronic affections of the external and middle ear, unless accompanied by otorrhœa, I believe counter-irritation behind the ear will be found a reliable agent. Its use, however, must be persistent and thorough, not allowing any intervals of non-irritation of the parts during the whole course of treatment.)

We will now, gentlemen, go on to consider that which must never be neglected—the treatment of the mucous membrane of the pharynx. Nothing will do so much to retain a chronic hyperæmia of the mucous membrane of the ear, as an old congested condition of the same membrane in the pharynx.

Cauterizations of the affected membrane do excellently well. The solid stick adapts itself better in granulations, or in very intense general swelling; but even in the last-mentioned cases we should not cauterize too large a portion at once, lest there be trouble in swallowing, and the effect on the larynx and trachea be too great. We should content ourselves with touching one or two spots, especially on the side of the pharynx, where the already described red swellings extend from the Eustachian tube. In order to be able to touch the upper part of the pharynx with the caustic, I use a caustic holder, such as is used in cauterizing strictures of the urethra, being a laterally opening tube, at the end of a strong

silver wire. This is introduced through an ear catheter. It is especially useful for swellings, such as rhinoscopy shows often exist near the entrance of the Eustachian tube.

I would generally, however, advise you to use solutions of nitrate of silver, at a strength of from twenty to fifty and even sixty grains to the ounce. For the lower portion of the pharynx, that opening into the mouth, a camel's hair pencil is best adapted for conveying the solution; and for other parts, a whalebone, with a piece of sponge attached, bending the bone according to the part we wish to touch, and thus we are able, while the patient takes a long breath, not only to reach the part near the tube, but also even to the base of the skull, if we go *cito et tute.*

The irritation of such a cauterization of the upper part of the pharynx is very various; the pain caused is seldom of very long duration, and is most marked in swallowing. A considerable mucous secretion very often results, or an increased flow of saliva; sometimes severe fits of sneezing—very rarely hemorrhage from the lungs—for a little time, small quantities of blood are mingled with the expectorated matters. In a case where the sponge had been directed extremely towards the mouth of the tube, a marked increase in the hardness of hearing was noticed for some hours after, caused by an increased congestive swelling of the mucous membrane. It is seldom necessary to gargle the mouth with cold water after such a cauterization. The change in the pharyngeal membrane, after cauterization, occurs very rapidly; sometimes after one or two applications. It is to be applied daily, or at longer intervals, according to circumstances.

Gargling is of great benefit to the membrane, partly with cold water, partly with prepared gargles. I make them more commonly from alum or iodine.

℞.
Alum pulv. ʒ i.—ʒ ij.
Aq. distillat. ℥ viij.
Spts. vin. gall. ʒ i.—ʒ iij.
M.

This addition of brandy covers the astringent, unpleasant taste of the alum, while the common honey and sugar mixtures are only unpleasanter.

Gargles of iodine are peculiarly adapted to children, when

there is a severe swelling of the glandular portion of the mucous membrane.

℞.
Tr. iodin, ℈i.
Potass. iodid. ℈ij.
Aq. distillat. ℥ viij.
Spts. vin. gallici ʒi. — ʒ iij.
M.

These iodine gargles have more than a local effect on the parts. I have seen goitre considerably decreased in size by its use, and ladies have called my attention to a growing smaller of the figure, a slight decrease in size in the breasts.

In cases, where secondary syphilis manifests itself in the form of ulcers on the soft palate, on the tonsils, and on the edge of the tongue, in the form of papules, or ulcerations, the tincture of iodine gargle, and also one with hydrarg. bi-chlorid. gr. i–iij to aquæ ℥ viij., will be found beneficial.

Besides these, there is a variety of preparations which can be used with profit.

According to my view, gargles do more good to the parts from their subsequent effects, than from those when directly in application. If we examine the structure of the mucous membrane we will be convinced, that the layer of it, richest in mucous glands, not only lies *over* the muscular fibres, for which reason these glands must be greatly affected by each muscular contraction, but also, that in many places, especially in the soft palate, the arrangement of the muscular fibre is such, that it passes around, envelopes, and grasps many of the glands. Every energetic contraction of the muscle, then, must make a certain pressure on the glands, and violent swallowing motions will assist greatly in ejecting their contents, the mouths of the glands being quite patulous, especially in the uvula, and anterior surface of the soft palate.

If we wish to use gargles, they must be used properly. As generally used, the patient standing, and with the head thrown backwards, and moving the gargle about, with the well-known roaring sound, no parts beyond the teeth, the dorsum of the tongue, with the uvula, and most prominent portion of the tonsils, are touched by the gargle, and the whole muscular action consists of a strong to and fro motion of the uvula. In such a manner of gargling, there can be no such thing as

touching the posterior pharyngeal wall, and energetic muscular contraction. In order to effect this, gargling must be practised in a different manner. Let the patient sit, or, better, lie down, with the head thrown back as far as possible, and taking the gargle in the motion, continue to make repeated swallowing motions, without, however, admitting the fluid into the œsophagus. Try this method of gargling in your own person with simple water, and you will convince yourself, by the sensation experienced, that many more parts are brought in contact than by the commonly practised noisy method; and you will furthermore find, that a more or less considerable amount of mucus is ejected during or immediately after the act, if the membrane is in a congested condition. Frequent gargling, if only with cold water, is an excellent remedy in chronic pharyngeal catarrh. Not only in that every abnormal collection of secretion is prevented, but also that the normal secretion is improved. With this there also occurs a gymnastic exercise of the muscles involved in the swallowing act. Every striated muscle increases in volume and power, by means of constant and methodical exercise, as you all can see in gymnasiums, the exercises of the Turners, etc.

Now but turn this result of our general experience to the muscles of the throat, you will see the value of such exercises when you consider at the same time the importance of these muscles for the functions of the Eustachian tube, and the normal condition of the middle ear; and remember that in chronic pharyngeal catarrh, a great power is necessary for the muscles of the tube, a power which can only be obtained when the muscles have been developed in size and power. You will see, if you remember all this, that gargles and frequent action of the muscles used in swallowing, are the best remedies for insufficiency of the muscles of the tube, which, as we have seen, occurs very often in aural and pharyngeal catarrh.

You see, gentlemen, that I esteem gargles, especially from a mechanical, or, if you please, a gymnastic point of view; and I assure you these are no theoretical and *a priori* speculations; but I have seen important results from simple gargling with cold water when continued for a long time.

Patients who have suffered from noises in the ear and difficulty in swallowing from long-continued pharyngeal and aural catarrh, who, with the slightest cold, have pain in the throat, and increased secretion in the fauces, and an addition to their loss of hearing, who awake every morning with a burning dry larynx, heavy head, and a fullness in the ear, and who could remove the collected mucus only with much difficulty, such patients I have seen, for a greater part, freed from all these symptoms, become in every way better, and the affection of the ear brought to a stand-still.

This gargling should be done at least twice a day—early in the morning, and just before going to bed. In connection with this, the patient can also snuff water into the nose.

The mucous secretion in the upper pharyngeal space is so considerable in many persons, especially around and behind the mouth of the Eustachian tube, that with almost every introduction of the catheter a mass of greenish gray mucus will be drawn out, and a loud rattling sound excited at the beginning of the passage of air. In such cases, I have seen important results from repeated injections of cold water into the nose, diminishing the fœtid smell from the nose and pharynx.

If the nose be injected with the ordinary ear syringe, the posterior and lateral wall of the pharynx will be touched too little, and many patients have a severe pain in the forehead, especially if the opening of the syringe be directed upwards. I have, therefore, caused a silver tube to be made, of the same length with the catheter, whose end is closed, but the sides, for a little distance from the extremity, perforated with little holes. By means of this instrument, we are able to reach the wall of the pharynx more conveniently and safely. In order that the patient can better apply the syringe himself, the outer extremity is bent nearly to a right angle. The introduction of such a tube is easily learned even by the least intelligent. The water will generally pass again out of the nose. Many patients have told me, immediately after the injection, that the head felt much freer, and that the noises in the ear were sensibly diminished; and speak often of astonishingly large quantities of mucus which have been removed in this manner.

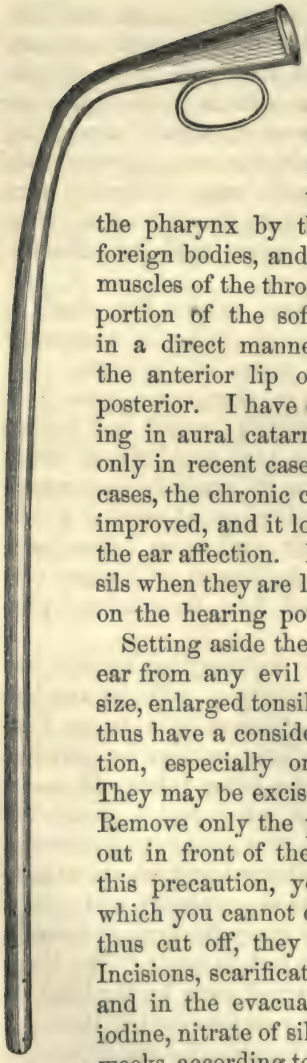


Fig. 10.

If the tonsils be abnormally large, they must be removed, or else the treatment will have no lasting effect. Hypertrophied tonsils, if not themselves the seat of frequent inflammation and abscesses, retain the chronic congested condition of the pharynx by their presence, since they are like foreign bodies, and prevent the normal action of the muscles of the throat; moreover, they press the broad portion of the soft palate upward, and thus, but not in a direct manner, as is generally believed, press the anterior lip of the Eustachian tube against the posterior. I have only seen improvement in the hearing in aural catarrh, after the removal of the tonsils, only in recent cases, and in children; but even in old cases, the chronic catarrh of the pharynx is very much improved, and it loses the inclination to an increase of the ear affection. But I advise you to excise the tonsils when they are large, even if they exercise no effect on the hearing power.

Setting aside the fact that a removal will guard the ear from any evil consequences on account of their size, enlarged tonsils are a hindrance in respiration, and thus have a considerable effect on the whole constitution, especially on the development of the chest. They may be excised with the Fahnestock instrument. Remove only the portion of the tonsil which reaches out in front of the arch of the palate, since, without this precaution, you may have severe hemorrhage, which you cannot check. The end of the tonsil being thus cut off, they will afterward fully shrink away. Incisions, scarifications, are only useful in fresh cases, and in the evacuation of abscesses. Penciling with iodine, nitrate of silver, etc., even when persisted in for weeks, according to my experience, produces no result.

Finally, gentlemen, to take a comprehensive view of the general condition of the patient suffering from chronic aural catarrh, we shall not be able in each case to find all the symptoms which I have detailed to you.

Make the patient attentive to each influence which works favorably or unfavorably on his condition. If the patient works for a whole day with bended head in an over-heated office or counting-room, perhaps never enjoying more than half an hour fresh air in a week, in the evening smokes and drinks in a restaurant or bar-room, sleeps in a small unventilated room, he has very many opportunities to develop an aural catarrh to its utmost, and you can never be able to lessen the disease, whatever you may do. Fresh air, and exercise in it, clothing adapted to the weather, woolen or silk next to the body in winter, care that the feet are dry and warm; moreover, he should avoid whatever interferes with the free circulation of the blood, tight articles of dress, costive bowels, and long-continued sitting in a bent position. The use of mineral waters, carefully chosen according to the patient, are of great service in connection with local treatment.

Cod-liver oil, with a mixture of ol. terebinth., seems to me to lessen the tendency to aural catarrh. Take ʒss. to ʒi. to ℥i. of cod-liver oil, and disperse the taste with a little oil of cinnamon or sarsaparilla. Attention to the condition of the skin is very important; in the cold season, a warm bath weekly; in summer, cold ones—guarding the ear from the entrance of the water.

Salt-baths seem to do such patients harm. Water cures, where so much is done by rubbing and packing in water, and which many persons believe to be a panacea, are to be avoided. They are the frequent causes of injury to the membrane of the middle ear.

From the "London Medical Times and Gazette," Aug. 22, 1863.—*Foreign Correspondence. Berlin.*

"Some time ago, a committee was chosen by the Medical Society of Berlin for the purpose of settling certain pending questions in aural surgery. The committee consisted of Messrs. Virchow, Krieger, Leyden and other well-known men, and have quite recently reported the result of their experiments, which have been conducted in the most unexceptionable manner.

"If air is blown into the Eustachian tube by means of a wide silver catheter, the membrana tympani being intact, this

air does not penetrate into the cavity of the tympanum, and it is equally impossible to inject, by this method, any considerable amount of liquid into that cavity, even if the permeability of the tube has been proven by previous sounding and auscultation; but both air and liquids may be injected, if a fine elastic catheter is introduced up to the osseous part of the Eustachian tube. The sounds, which are heard on injecting air, are only produced when the latter method is adopted, and in the cavity of the tympanum itself, while such sounds as are perceived on using the ordinary silver catheter are most likely caused within the pharyngeal end of the tube. A change in these latter is due to an impediment in the conduction of sound, and we may find out therefrom whether the impediment is movable or immovable, but it does not give us any hints as to any changes that may have taken place in the coats of the tube or the cavity of the tympanum.

"It is impossible to decide at present, whether we may *by blowing in air with the fine catheter succeed in removing free effusions from the cavity of the tympanum.* It is settled beyond doubt, that liquids may, through the catheter, be introduced into the cavity of the tympanum. The diagnostic and therapeutic value of sounding can therefore not be doubted."

(I have thought it well enough to insert the above, which has just come to my eye, its conclusions being so opposed to those of Drs. Tröltsch and Kramer—in fact, to those of all the continental aural surgeons.

I have not been able to obtain the original report, and consequently cannot know the nature or manner of conducting the experiments on which the conclusions are based.

It is of no importance as to what I believe, when such names as Virchow are in the question; yet I cannot help stating that I believe there is a fallacy somewhere in the reasoning, which concludes that air cannot enter the Eustachian canal and thus go on to the cavity of the tympanum through a silver catheter whose beak is in the pharyngeal orifice of the tube.

The report says: "If air is blown, etc." This may be so worded, as to avoid saying, "if air be pumped," as Tröltsch's method is; but in either case, I am skeptical as to the value of the report as here presented, or as to the correctness of the

conclusions, founding my belief on the aural practice I have seen in the hands of eminent surgeons, and on my own recent experiments. I cannot believe as yet, judging from my own sense of hearing, that air does not enter the cavity of the tympanum, when blown through the silver catheter.

With Dr. Von Tröltsch's high estimate of the therapeutic value of the catheter, I am by no means in full accord, although I have not thought it well to contrast my crude and comparatively short experience with his carefully considered opinions, the result of years of special practice.

LECTURE XVII.

ACUTE OTITIS INTERNA, OR ACUTE PURULENT CATARRH.

General Remarks as to the Different Forms of Acute Otitis Interna.—Is often Overlooked, or not Properly Regarded.—Case of Paracentesis of Membrana Tympani.

GENTLEMEN—The inflammation of the middle ear, to which we have confined our observations up to the present time, was the simple or mucous catarrh. As is the case with all inflammations, this catarrh soon passes more into the interior of the tissues, becomes interstitial, and causes a thickening of the parenchyma, and soon also declares itself, in connection with the swelling and thickening of the tissues, by an increase of secretion, an exudation, if you choose to call it so. This product of inflammation in a simple aural catarrh consists of mucus and of conglomerated broken epithelium cells, which last is especially found in great masses in the ciliated epithelium of the Eustachian tube. As is well known, if this inflammation go on to a higher grade, it leads to a preponderating development of free cell-formation, to discharge of pus upon the inflamed mucous membrane.

Observations upon the living and dead subject teach us that *purulent catarrh* also occurs in the middle ear, although much less often than the mucous catarrh, and that it occurs in two forms, acute and chronic. The inflammatory product, besides containing the puriform element, also contains mucus and epithelial masses. Since, as a rule, the inflammatory products of mucous membrane are of a mixed character, the name *purulent* or *mucous* catarrh only indicates that either one product or the other is in excess. Whether *croupic* or diphtheritic inflammations also appear on the mucous membrane of the middle ear, I do not know; I have as yet not observed any such cases. I examined, in two cases, the middle ear of children, who died

from laryngeal croup. In one case the membrane was only hyperæmic, in the other it was greatly swollen on each side, and the cavity of the tympanum full of pus. I found no evidence of fibrinous exudation in the canal or cavity of the tympanum, acute purulent catarrh of the middle ear, or acute otitis interna.

We often find evidences of this disease on the dead body in children; then we observe it as a participant and consequence of the exanthemata, measles, scarlet fever, and small-pox, also in typhus fever and consumption. Furthermore, it occurs from a chronic inflammation of long standing rising to an acute form. Under very unfavorable circumstances, as to the patient, or improper treatment, acute simple catarrh may be developed into the purulent form. Acute purulent catarrh also occurs in weakly scrofulous constitutions, which are disposed to purulent formations after injuries, or impressions which in healthy persons would have only caused a simple catarrh.

This affection has heretofore been described by most authors as acute inflammation of the membrana tympani. The symptoms are very similar to those in acute simple catarrh, but are much more severe, and the general condition of the patient much more disturbed. The pain, which is generally very intense, extends from the ear over the whole side of the head, and increases with every movement; it becomes unbearable, if the patient attempt to walk on any hard substance. The immediate neighboring parts are generally somewhat infiltrated with serum, somewhat swollen and sensitive; there is also a severe burning feeling felt in the depth of the ear in most cases. The febrile condition is so great as to often extend to delirium and stupor.

You will see that such symptoms as these, occurring in an exanthema, or typhus fever, and which can only be referred to the ear, will be little observed in consequence of the danger from the general condition of the patient, and in their beginning probably never referred to the correct source. The aural surgeon does not often, therefore, see these cases in their incipient stages, if we except those cases in which an ancient purulent catarrh, with perforation of the membrana tympani, suddenly becomes acute.

The error which I called your attention to in a former lec-

ture—that is, confounding an acute mucous catarrh with an inflammation of the brain, may be also fallen into here; for there is always, in acute purulent catarrh, a hyperæmia of the dura mater, lying over the petrous portion of the temporal bone, and a proportionate effect on the sensorium.

So long as no purulent discharge occurs, the general condition of the patient prevents any particular attention from being paid to the ear; and the delirious or somnolent patient is in no condition to indicate the seat of his sufferings. The common exit of the process is perforation of the membrana tympani, with which the pain is very much diminished, and a purulent discharge takes place, if there has not already been a participation of the external auditory canal in the process, and an otorrhœa from this part.

There is often developed, at the same time with the purulent inflammation of the cavity of the tympanum, an acute otitis externa, proportionate to the intense hyperæmia, in which all the structures are found. According to several sections, which have been made in typhoid fever, the labyrinth appears also to be in a state of congestion.*

In cases where a chronic otorrhœa, with perforation of the membrana tympani, increases to an acute inflammation, the discharge is often suddenly lessened, or disappears entirely. This symptom is often incorrectly interpreted.

This acute inflammation does not occur, because, as a result of a certain treatment, or any accidental coincident injury, cold, blow on the head, the secretion has been diminished, or, as some are accustomed to express themselves, "driven in," but on the contrary, the discharge, which has been previously profuse, has become less, after an occurrence of an acute inflammation of the membrane furnishing the secretion, just as we can see the secretion diminished in a chronic catarrh, which has suddenly gone on to an acute stadium.

* The best brochure on diseases of the ear occurring in typhus fever is from Dr. Hermann Schwartze. See "Deutsche Klinik," 1861, Nos. 28 and 30.

According to Dr. S., there are three processes forming the origin of ear-affections in this disease.

1. Purulent catarrh of the cavity of the tympanum.

2. Catarrh of the pharynx with closure of the pharyngeal end of the Eustachian tube.

3. Cerebral deafness, due perhaps to the poisoning of the blood.

Simple chronic catarrh, occurring in typhus fever, as in scarlatina and roseola, is quite common, and it is possible for it to run its course without any perforation of the membrana tympani, leaving only a swollen and congested condition of the cavity of the tympanum behind; and so also the purulent catarrh may run its course, and leave no other residue.

The most severe and dangerous form of the disease of which we are now speaking, is that in which there is such a power of resistance on the part of the membrana tympani, that the abscess cannot be discharged by its perforation. There are a number of such cases on record, where, after the most terrible agony and severest symptoms, the inflammation extended to the membranes of the brain, and death quickly followed.

We cannot know how often such cases occur, unless there be an examination of the ear after death.

The perforation of the membrana tympani, therefore, may be sometimes considered as a favorable turn in the condition of things; yet, even if an exit thus be formed for the pus, the disease can still go on to a fatal result.

This most often occurs in children, after one of the exanthemata. Later on, we will describe such a case in detail.

The objective symptoms, in the beginning of an attack of acute purulent catarrh, are similar to those of a severe case of simple catarrh. The plane of the membrana tympani is altered, by the pus which has collected behind it, which bulges or pushes out some parts of its surface. Single vessels are not often to be seen, but a fine red appearance, indicating the hyperæmia of its mucous surface, is mingled with its dull gray color. Sometimes single red spots (extravasations) can be seen on it. In severe cases the mastoid process is painful and sensitive, and has an infiltrated, shining, red appearance. Examination also often reveals a considerable swelling and redness of the pharyngeal mucous membrane, and the Eustachian tube will be found impermeable.

Prognosis.—This is more unfavorable than in the acute form of *simple* catarrh.

Very few physicians can bring themselves to pay the least attention to the ear, in the constitutional diseases of which we have been speaking; and they are the very ones in which its functions are most apt to be disturbed. Never are ear affec-

tions so completely disregarded and placed in the background, as in those affections which confine a patient to bed. How many trouble themselves about the consideration of the ear in typhus fever, in tuberculosis, or in scarlet fever? An American surgeon (Dr. Edward Clark, of Boston) says, in an excellent article on "Perforation of the Membrana Tympani, its Causes and Treatment" (*American Journal of Medical Sciences, Jan.*, 1858): "So necessary is a careful attention to the ear, during the course of an acute exanthema, that every physician who treats a case, without careful attention to the ear, must be denominated an unscrupulous practitioner." How severe this must sound to the most of German physicians! It is certain that if every physician were to inform himself of the condition of the ear, as well as of the skin and kidneys, pulse and bowels—I will not insist that the ear should be examined with a speculum—we may merely inform ourselves as to its condition in a general way—if this were done, I say, many a child would not be deaf and dumb, and many incurable cases of deafness, and many life-long otorrhœas would be avoided.

There is such a number of acute diseases in which the ear is also affected, that the physician should always examine as to its condition, without waiting for the patient to announce his affection.

Even with the most careful attention, and when the special symptoms lead us to take every care for the ear, we will sometimes be unable to prevent the perforation of the membrana tympani. However, there will not be so much lost as if it had been entirely neglected, and there is still left a wide field for surgical assistance to prevent the otorrhœa from becoming chronic, and further consequences.

Treatment.—This must be decidedly antiphlogistic. According to the general condition of the patient, we must use local depletion—placing a number of leeches around the meatus, so that the hyperæmia may be reduced and the inflammatory process weakened. The severe pain and tension will be relieved by often filling the meatus with warm water. When the otitis, as is often the case in measles and scarlet fever, is accompanied by considerable inflammation of the pharynx, or this has been the origin of the whole process, the greatest attention must be paid to this. Apply cold water to the neck

(or better, large, frequently-changed flax-seed poultices); cause the patient to gargle frequently, if possible; cleanse the naso-pharyngeal cavity by injections; and, if necessary, cauterize the throat with the nitrate of silver.

(I am of opinion that in this and all other acute inflammations of the mucous membrane, of the mouth, throat or larynx, the greatest amount of good will be experienced by the use of the inhalations of the vapor of some aromatic herb—catnip, for instance—or of simple warm water. In burns of the throat, from the inhalation of steam, in incipient œdema glottidis, in aphthous ulcers of the mouth, I have seen the pleasantest results from this simple remedy. Dr. Gurdon Buck, the distinguished senior attending surgeon of the New York Hospital, is in the habit of advising this for some of the cases to which I have alluded, and I am persuaded that it will be found equally efficacious in affections of the pharynx.) You must not consider this as a too energetic treatment, but remember that the life and happiness of the patient depend upon your promptness and care.

Aural inflammation, in scarlet fever and measles, furnishes the greatest number of the inmates of deaf and dumb asylums, as well as a large proportion of our cases of deafness, of a high grade, in consequence of the readiness of the ear to participate in the exanthemata, and, as we must confess, from the complicity of the physician in neglecting the complication.

In cases where the inflammation and pus formation is considerably advanced, and where we will probably not be able to prevent the perforation of the membrana tympani, when perhaps this result is wished for, we can encourage the suppuration by the application of warm poultices to the ear, or a paracentesis of the membrana tympani may be performed, where it is most prominent. In one case I was able to see the sudden improvement which occurred after such a paracentesis, without any discharge of pus.

A woman working in a factory, 27 years of age, applied to me. After having suffered for ten days with a very intense pain in the ear, with transient discharges, I examined the membrana tympani, and observed a spot like a blister from a burn, about as large as a pea—such a one as you may see if the patient has burned the membrane by a too warm ear-wash. This

could not have happened in this case, since the patient had put nothing at all in the ear. The remaining portion of the membrana tympani had a dense reddish-gray appearance. There was great pain in the ear and the mastoid region, the latter being reddened, temperature increased, and sensitive on pressure. I opened the blister immediately, with an instrument such as is used in paracentesis of the cornea, and evacuated a drop of serum. At this moment the patient breathed freer, and declared that the pain had almost entirely disappeared; and what was in the highest degree remarkable, the mastoid process was less sensitive to pressure, and the patient enabled to open the mouth, which she was before unable to do.

LECTURE XVIII.

PURULENT CATARRH IN CHILDREN.

Up to this time only known through Pathological Study.—An attempt at an Explanation, and its Practical Value.

GENTLEMEN—I am about to speak to you of a form of purulent catarrh, which I am acquainted with only from post-mortem evidences, and which, as seen in the living, I must leave to those who have abundant opportunities to study the diseases of children. In the course of my examination of the normal and pathological anatomy of the ear, I happened accidentally on a peculiar condition in the ears of very young children, and which excited my attention the more, in that I observed it so frequently. In the greater number of auditory apparatus of children, which I have had the opportunity of examining, forty-eight petrous bones of twenty-five children (when I except one case of caries of the temporal bone, on each side), I found, in forty-six bones belonging to twenty-four children, the middle ear normal thirteen times—the remaining thirty-three ears of seventeen children were affected with purulent catarrh of the middle ear. The cavity of the tympanum, the upper portion of the Eustachian tube, and the cells of the mastoid process, were filled with a greenish-yellow, sometimes a species of creamy substance, showing evidences of being pus—and so proving to be, under the microscope. It appeared composed of roundish cells, with a quadrilateral nucleus or nuclei, which were often visible without the use of acetic acid. The clouded appearance of the cells cleared up on the use of the acid, but contained, besides, little fat cells. These collections of pus filled the whole of the space which the swollen mucous membrane had left. The membrane was always in a very hyperæmic condition, and occasionally there was a net of very delicate vessels, and the membrane was so hypertrophied that

the ossicula-auditûs were imbedded in it, and their outlines scarcely to be made out. The mucous membrane of the membrana tympani also appeared slightly infiltrated, and covered over with a net-work of vessels. The membrane was never perforated or in a state of ulceration.

With these appearances there also appeared, in eight cases, and always in cases where the contents were of a milkish consistency, peculiar red bodies, from the size of the point of a needle to that of a hemp seed, which were quite hard in feeling, and were firmly attached to the mucous membrane. On nearer examination, they proved to have a richly vascular cortex, and an internal structure, sometimes of granular-like fat, now of cells. All other explanations are wanting as to the nature and origin of these puzzling bodies, to which I know no analogous structures.

The bodies of which the examinations were made were taken without choice, as I could obtain them during the space of three years and a half, partly from the city and partly from the Lying-in Institution, in connection with the Medical School in Würzburg.

The youngest child was seventeen hours old—the oldest, one year. Of the children with a normal middle ear, two were fourteen days old, one seventeen hours, one four days, and the remaining three, six and eleven months, respectively. The bodies were often such as were furnished to the students for the study of normal anatomy, since in the post-mortems which had been held, the immediately affected portions were the only parts examined; twelve were of this class. The other post-mortem appearances were various, corresponding to the condition in life of these half-starved, poorly-cared-for children. The diseases of which they died were atrophy, inflammation of the bowels, partial collapse of the lung—bronchitis. There was venous hyperæmia of the coverings of the brain in almost all the observed cases, and congestion of the brain substance. In those cases in which there was no pus in the cavity of the tympanum, there were no other pathological appearances. Thus much for the facts.

Since, in our school in Würzburg, we do not often have an opportunity of examining older children, I must leave to others the work of ascertaining if these appearances obtain in like

proportion in children of larger growth. I am in possession of one history of a case of an older child, for which I am indebted to the kindness of my honored friend, Professor *Streckeisen*, in Basle (I take the liberty of somewhat condensing the case, which Dr. Tröltsch gives in full, on page 177 of the original of this work): "A well-developed, healthy child, six years of age, after returning from a walk, was seized with headache, heaviness, and bilious vomiting. After a restless night, on the following day the symptoms disappeared. On the evening of the second day, same symptoms return, surface heated, pulse 130—all the appearances of congestion of the brain. Treatment, leeches between lower jaw and mastoid process, cold application to the head, cathartic. Symptoms disappear, and do not return for three or four days. Fifth day, all the symptoms of cerebral congestion reappear—restlessness, disposition to weeping, anxious visage, head hot, slow drawing back of the tongue, etc. Blood was taken from the Schneiderian membrane, cold applications to head, and cathartic of calomel. Symptoms again disappear.

6th day. Gradual symptoms of cerebral pressure began to appear, drowsiness, some difficulty in waking, remaining till 7th day, when pouring cold water over the head, seemed to have somewhat revived the patient, though not fully.

8th. Paralytic symptoms appeared.

9th. Increased, and on

10th. In the morning she died.

Sectio Cadaveris showed serous infiltration and congestion of the brain, swelling of brain substance, and consequent pressure. Both lateral sinuses filled with coagula. Cavity of the tympanum, and mastoid cells, on both sides filled with pus. Mucous membrane of the ear greatly injected and swollen. Membrana tympani slightly sunk inwards.

The following facts are especially remarkable in this case.

I. The very slight prominence of the pain in the head on the first and second day. On the reappearance of the affection on the fifth day, this symptom appeared, accompanied by sobbing and crying.

II. Entire want of convulsive symptoms during the period of irritation, rapid progress of the cerebral pressure, and paralysis.

III. Entire absence of pain referred to the ear, although,

in this respect, no special observation was made ; yet so much is certain, that the little patient spoke of no such pain ; and on the sixth and seventh days heard perfectly well ; at least, in the lucid moments, in conversation with its brothers and sisters, it gave clear answers.

There were no evidences in the petrous bone to prove the origin of the affection in the ear, but the inflammatory results, in the cavity of the tympanum, had reached the greatest degree of development. It is to be hoped that physicians will interest themselves in these cases, and by means of close observation bring the subject to a determined point. The author (and translator) will be glad of any such communications.

Although the number of these cases, as yet examined, is not very great, still it is indicative enough, since the subjects were taken at chance and scattered through a considerable period of time.

Now, gentlemen, what shall we conclude from the development of these certainly unlooked for facts ? Can we believe that we are here dealing with a normal and physiological, and not a pathological condition ? We must consider these appearances as morbid, since they do not always appear ; but only 13 out of 46 examined were free from them.

The experience of physicians, however, has not shown that purulent inflammations of the ear appear so often.

May it be true, that such an otitis interna as our anatomical examinations have shown is only anatomical or normal, and never showing itself, by any disturbing symptoms, during life ?

As I have already said, I am not able to give a positive answer to this question. Is it probable, however, that changes in structure, similar to those which in adults give rise to evident symptoms, and which affect, not only the part involved, but the whole organism ; is it probable, I ask, if these changes produce no results, when occurring in children ? In general, we know that the nervous system of a child reacts even as strongly as that of an adult to any disturbing cause.

As long as we have no positive evidence, should we not assume that these cases have not been properly estimated, or properly observed ?

I have been obliged, in almost every section of aural surgery which we have studied together, to show you more or less im-

portant facts, which have either not been esteemed enough, or have been improperly estimated, or as facts which have escaped the observation of practitioners and aural surgeons. I will only now recall one instance to your mind. How far, hitherto, have physicians known that a sluggish intellect, dullness in the head, and troublesome attacks of vertigo, have had anything to do with a diseased condition of the ear? To the aural surgeon, the daily occurrence of such cases proves the co-existence of symptoms and condition. Notwithstanding this, the most cultivated clinical physicians seem to have no idea of this, and you will not find in the writings of German aural surgeons any thing to indicate that these things may be observed.

Nowhere dare we leave less to authority, nowhere can we rely so little on previous researches, and nowhere can considerate and assiduous observations of clinical and anatomical facts find so much that is new and unexpected, as here in the pathology of aural surgery. The previous laborers have left much to be done. How insufficient and wanting have been the observations hitherto made on the living? I have been already obliged to show you observations on the dead body in some directions are entirely wanting, in others are incomplete.

If, for instance, in the examination of the infant cadaver, attention had been turned to the temporal bone, the striking appearances then seen would have certainly arrested the attention of the physician. The examination has been neglected; the facts have, consequently, not been shown, and now-a-days it is only exceptionally that a physician who can give no point of origin for the pain, thinks of the ear, and of the possibility of an inflammation there, until a purulent discharge shows itself.

If we examine more closely the literature of the subject, we find that in various times, observing and careful men have plainly shown that perforation of the membrana tympani, and the otorrhœa following it, were only results of otitis interna, and that this must always precede the otorrhœa, and that we attempt to recognize the affection earlier, in order to guard against the purulent discharge, and cause the whole process to run a mild course. In 1825, Dr. Schwartz, a physician in Fulda, said, that "inflammations of the ear are very often over-

looked, occurring in children not old enough to speak," and he called attention to the symptoms by which it might be distinguished from other affections, especially from inflammation of the brain and its membranes.* Frederich Lud. Meissner, in his *Text-Book of the Diseases of Children*, says, that "aural inflammation is of that kind most commonly overlooked in childhood, because children are not able to indicate the situation, kind, and degree of the pain." It is most commonly confounded with diseases of the brain.

According to Helfft (1847), "the symptoms of otitis interna in children are very similar to true meningitis.† We must always look to the head as the point of origin of loud and intermittent cries of pain, when the chest and abdomen have been found in a normal condition. The absence of vomiting and constipation, as well as the slight febrile reaction, is evidence that there is no considerable inflammation in the brain."

These various warnings seem to have been little regarded; and since they were given, we seem to have gone backward; for you will find no attention paid to the subject in our present text-books. In the well-known works of Rilliet and Barthez (1853), and in those of Bouchut (1852), I can find nothing pertaining to the subject, and quite as little in other text-books on the diseases of children, even in those which have appeared since 1858, in which year I made my first communication, concerning this peculiar post-mortem appearance in small children, to the Medical Society of this city.

But, gentlemen, not only anatomical facts, but also daily practical experience proves to us the uncommon frequency of diseases of the ear in children. Earaches are such common occurrences in children who are old enough to give the seat of pain, that there is scarcely a child that has not suffered at one time or another with them. Examination shows that this earache generally depends upon inflammation of the external or middle ear, and that it is seldom of a nervous neuralgic character. Of the otorrhœa that comes under our care, the greater part, certainly more than half, had its origin in

* See *Seibold's Journal für Geburtshilfe*, B. 5, Hft. 1. Again presented in the third part of *Linke's Sammlung auserlesener Abhandlungen und Beobachtungen aus dem Gebiete der Ohrenheilkunde.*

† *Journal für Kinderkrankheiten, Schmidt's Year-Book.* 1848. B. 58, p. 337.

childhood or infancy. Hardness of hearing, of different grades, will often be found in children when a test examination is made.

If, then, it is a generally acknowledged experience, that inflammatory diseases of the ear are quite common in children of advanced age, it is probable that they occur quite as often in the very first periods of childhood ; but we are not so well assured as to this, because of the difficulty of recognizing the affection in infants, where there is no purulent discharge. The anatomy of the parts, and the history of their development, show us facts which prove how favorable circumstances are in infancy to disturbances of nutrition in the cavity of the tympanum.

I must call to your attention that process of dura mater, so rich in vessels, which in childhood extends, by means of the fissura petroso-squamosa, to the cavity of the tympanum and mastoid cells, and through which the dura mater and the mucous membrane of the middle ear come into closer relations in respect to nutrition than is the case with adults. Each disturbance of nutrition and circulation in the membranes of the brain, which are quite common to children, must extend to the middle, from the fact that the blood supply of both is conveyed in the same channel; and the reverse is also true,—every primary affection of the ear in a child is apt to produce symptoms of cerebral disturbance.

I must not omit to state here that all the children whom I examined, who were afflicted with otitis interna, and when I was allowed to make a full examination, showed also congestion and hyperæmia of the brain.

I have still further to describe to you the condition in which we find the cavity of the tympanum in the fœtus and the newly born child. As I have shown,* this does not contain the fluid of the amnios or mucous secretion, as has been previously generally believed, but is filled up with a cushion-like swelling of the mucous membrane of the wall of the labyrinth, which reaches up to the internal surface of the membrana tympani. The respiratory process soon diminishes this mucous growth, partly by shrinking, partly by degeneration of the structure,

* Würzburg Verhandlungen. B. 9, case 78.

and it gives place to air. According to several examinations of children who died during parturition, or not long after, the diminution in size of this mucous pillow was commenced before birth, and in such cases we find strikingly many epithelial cells filled with fat in the cavity of the tympanum.

We know, that in the first period of life, a developing process is going on in the middle ear. Our daily practical experience teaches us, that pathological changes, interfering with the nutritive processes, are more easily produced in parts which are increasing in power, and where metamorphosis and evolutions are going on. As an example of the truth of this, I call to your mind how often diseases of the female sexual system originate during the time of development, during each menstrual period, and especially during the puerperal process. If we add to these facts, that nasal and pharyngeal catarrh, which so often give origin to the catarrh of the ear, are the every-day experience of children, you will be less surprised at the uncommon frequency of otitis in the young subject, and it will be a question whether we are able to recognize the affection during life.

You comprehend, gentlemen, the difficulty of a diagnosis of an affection of the ear, unaccompanied by a discharge in young children, who are not able to designate any situation of their pain, and when it is impossible to make any sufficient examination of the part, or determine the degree of hearing. You see how we want fixed points of which to seize hold, such as we have in adults, in order to distinguish an inflammatory affection of the ear. Yet, you must not allow this state of things to deter you from your duty. We are very often obliged in internal diseases, especially in the practice among children, to keep ourselves with very few positive conclusions, and we must work by exclusion greater or lesser probabilities, and also look at the result of our therapeutics, to aid us in forming a diagnosis. We are not in a narrower limit for a diagnosis than in many other cases. The principal difficulty lies here:—the physician, who approaches the bed of the sick child, scarcely counts the various possibilities which go to clear up the affection. If we but once understand that affections of the ear belong to the common ones of children, and compare the symptoms with which these affections declare

themselves in grown persons with the peculiar ones of the infant organism, we will certainly be able, by exclusion of the other organs, to make our circle narrower and narrower, until finally, with more and more certainty, we have fixed upon the ear as the origin of the trouble.

Our conclusion will also be assisted by a previous experience.

Allow me, then, to enter into a further detail of the symptoms by which otitis interna in young children will declare itself. I must assume, however, that a diagnosis from analogy is allowable, since in the peculiar circumstances clinical proofs are wanting. Parents, who bring their children with otorrhœa to the physician, will often give considerable information as to the condition of the patient the day before the discharge began. When the collection of pus is at all considerable, the symptoms of irritation can scarcely be wanting, and the affection will declare itself in the morning, the child crying as if in severe pain.

Some physicians ascribe a peculiar character to the cry of children in otitis; whether this be true or not, we will leave undecided. Certainly the cry of pain which arises from pain in the ear, even when coming from strong men, is described as one of the most terrible, it being extremely severe and penetrating. This pain sometimes lasts whole hours, often days, without very long intervals, and is subject to severe exacerbations, especially during the night.

It can thus be distinguished from affections of the lungs, pleura and trachea, since in these diseases children can never cry loudly for any continued length of time. The cry from earache would most resemble that from inflammation of the bowels or brain, but the failure of the remaining symptoms of these diseases will allow us to distinguish them.

It will be important to note the circumstances under which the symptoms are decreased or increased.

In affections of the middle ear the pain would be increased in every shaking of the body, and every change in the position of the head, by every effort of swallowing, mostly in suckling, the child flinging itself away from the breast, or from the bottle at the first attempt, while its usual nourishment administered by means of a spoon will be more easily taken.

Cold, noise will increase the symptoms of pain, while perfect quiet, warmth, especially moist warmth, as pouring warm water into the canal, cataplasms over the ear, will quiet the pain. Nasal catarrh will be a common complication—cold in the head. You will find it very difficult to come to any conclusion as to the degree of deafness, or loss of hearing, which is connected with the accumulation of purulent matter in the middle ear. It is true, that even in the most tender age we can come to an unequivocal result, as to whether the child hears a loud noise or not, but who can tell whether a child does not respond to sounds in consequence of a morbid process connected with depression of the sensorium, or from want of power in his auditory apparatus in conducting the sound. When we remember the facts, often alluded to, of the relation of the vessels of the dura mater and the mucous membrane of the middle ear in the child, and the tendency of extension of diseases of the ear to the brain in the adult, we will not be surprised, considering the very impressible brain and spinal cord of the child, if the meningeal and cerebral symptoms are here much severer than in adults.

It is undoubtedly true, that a permanent deafness, or convulsions of the limbs, or spasms of the muscles, may be excited by an otitis interna.

The fact may have struck you that in the post-mortem examinations, whose results are now under consideration, the membrana tympani was never perforated, and took very little part, comparatively, in the morbid process. This fact is due to the width of the Eustachian tube in infancy. It is not only relatively, but absolutely wider than in adults, measuring in its narrowest part about a line and a half. Therefore, a complete closure of the cavity of the tympanum, and a consequent massing of secretion in it, with the well-known results, is not so liable to occur. These normal conditions allow us to say, that in the otitis of children there is much less danger to the membrana tympani of children than of adults, and that the prognosis is on the whole better, and perhaps the disease may run its course without any decided pain.

What shall be the therapeutics for an otitis interna thus diagnosticated as occurring in an infant? In the case of a strong, well developed child, we can apply one or two leeches behind

the ear to relieve the pain and hyperæmia. I would not generally apply poultices to the ear, since they will certainly excite a profuse otorrhœa, and the frequent filling the ear with warm water will probably subdue the pain quite as effectually.

Injections of cold or lukewarm water from the nose will have a good effect in removing mucus from the nasal cavities and upper pharyngeal space, and are especially to be recommended when there is a severe cold in the head, which is a frequent accompaniment of the otitis, and serves as an assistant in the diagnosis. In this place I would like to speak of an old woman's remedy for cold in the head—that is, the insertion of an oiled pointed pigeon's feather through the nose into the mouth; this to be done at somewhat frequent intervals, exciting sneezing, and assisting materially in clearing out the parts. Since there is a very slight amount of danger to the membrana tympani, and on account of the ease with which the secretions of the cavity of the tympanum are removed, an emetic will hardly be needed. As to the introduction of the catheter, I should not answer Yes or No. (I should answer No most decidedly. Practitioners will readily comprehend the almost impossibility of performing such an operation on a young child, and Dr. T.'s own facts as to the width of the pharyngeal entrance to the tube demonstrate its uselessness. Why the Continental surgeons have such a desire to introduce the catheter in every affection is as equally unintelligible as the aversion of British and American surgeons to ever using it.)

I hope, gentlemen, that in your future practice you will follow out this subject, and when you can ascribe no sufficient reason for the crying of a child, and for its deaf and convulsive condition, that you will remember the frequent recurrence of this pathological picture, which we have seen in these sections.

There is a prevailing custom among many physicians, to ascribe many of the troubles of the first period of life to the cutting of the teeth.

We cannot deny, that this view has historic right, as well as the *vox populi*, on its side, and that it is extremely convenient.

It does not appear to me, however, as proven, that a physiological process for which preparations have been made, and which goes on with so few local and sudden changes, should

constantly lead to constitutional disturbances of the system. Let it be as it may, I do not intend to mix myself with the vexed question; so much is uncertain, that in the practice with *Dentitio difficilis*, abominable malpractice is often seen, exact examination omitted, for the above convenient subterfuge, and much more important local disturbances overlooked. Among the last we may place otitis, which has just been described.

LECTURE XIX.

CHRONIC PURULENT CATARRH, OR CHRONIC OTITIS INTERNA.

Its Subjective and Objective Symptoms.—Treatment.—Perforation of the Membrana Tympani; its Importance.—The Artificial Membrana Tympani.

GENTLEMEN—We will speak to-day of the chronic internal otitis. This is much more common than the acute. It is either developed itself from this latter, or arises from the extension of an otitis externa or myringitis upon the cavity of the tympanum. It seems most often to result from a neglected otorrhœa of the external ear. We cannot believe in a long continued suppurative inflammation of the middle ear, which does not lead to perforation or impairment of the integrity of the membrana tympani. The pus will naturally run from its internal situation, outwards, and we may call this form otorrhœa interna, to distinguish it from that occurring from the external auditory canal.

In the greater number of cases, the beginning of chronic otitis interna may be traced back to the earliest period of childhood. The symptoms are mostly limited to hardness of hearing and a purulent discharge from the ear, both of various grades of intensity. Pain is only felt after some distinct causes have been at work—injury to the part during an ulcerative process, in the sub-acute stages, caries, etc. In the last named case, the pain is severe and long continued.

If we syringe the ear, we can observe two kinds of secretion. The purulent, which is equally mingled with the waters injected, and colors it yellow, and a mucous secretion which is not dissolved in the water, and which floats around the vessel in long and jagged masses. Sometimes there is more pus than mucus, and *vice versa*. There will also be little lumps, which consist of the dried epidermis of the external canal.

On examination of the lower portion of the auditory canal, we find it superficially softened and loosened. Often the bony portion of the canal is narrowed above, and latterly we see it discolored with scabs and crusts, consisting of dried and thickened scales of epidermis, which can only be slowly removed. These prevent a full view of the background, and their removal often, almost immediately, improves the hearing. The membrana tympani, as far as it exists, seems thickened in all its surface, often partly calcified, superficially, somewhat covered with secretion, more or less infiltrated and dense. The edges of the perforation are to a greater or less extent reddened. These perforations have been incorrectly described as of a round shape, and with a sharp border; they resemble kidney, with the hilus towards the end of the malleus, when the perforation occurs in the centre of the membrane. The handle of the malleus, at its lower extremity, is sometimes involved and lies in the middle of the perforation. If the membrana tympani be for the greater part wanting, then the uppermost portion of the handle of the malleus is only to be seen. This, with the processus brevis mallei, as well as the outer border of the membrana tympani, is generally, almost always, remaining, although it is often hard to recognise and distinguish from the neighboring swollen tissue. In all the cases, where the structure of the membrana tympani is perforated about the deepest portion of its concavity (called *Umbo* by Tröltsch and Hyrtl), the lower portion of the handle of the malleus, which is now deprived of its hold on the membrane, lies deeper in the cavity of the tympanum.

In some cases, the mucous membrane of the cavity of the tympanum is extremely little swollen and hyperæmic, while in others it is so to a high degree. It is generally covered at the lower part with secretion, which can be pushed outward through the Eustachian tube, with a slight sizzing sound. In cases where the whole cavity is filled with pus, and the hole in the membrana tympani is a small one, the patient can press the secretion through the perforation, drop by drop, without the slightest sound. At the moment when the patient stops the pressure, the drop, which was at the time passing through the perforation, will fall back into the cavity of the tympanum Occasionally the edge of the perforation, even when it has no drop of fluid, pulsates with the motion of the heart. This is

regularly the case when there is any pus or fluid on the inner surface of the perforation; and then the pulsation is doubly distinct, on account of the strong and glancing light of the drop.

As a consequence of this deficiency in the membrana tympani, that part of the wall of the labyrinth—the promontory, lying opposite the lower and anterior portion of the membrana tympani—can be distinctly seen, even when the mucous membrane of other parts is not swollen, with vessels running over it. We can often, also, distinguish the anterior edge of the entrance to the fenestra rotunda. The membrane of the fenestra, in consequence of the oblique position of the niche on whose border it is first attached, you will not be able to distinguish, even if the whole of the membrana tympani be gone. The long process of the incus more often entirely fails to be seen. If it be wanting, the connection between the stapes and the other bones composing the chain is of course broken. We are occasionally, also, able to distinguish the little head of the stapes—generally situated on the most posterior and upper edge of the visible wall of the labyrinth—as a little elevation covered with reddened mucous membrane. Finally, a more common condition, both on the living and dead subject, is a union of the edges of the perforation with the *ossicula auditus*, or with the promontory.*

The degree of hearing remaining in the above described conditions is very various, reaching from total deafness to enough understanding of what is said to suffice for ordinary vocations. It depends greatly upon the amount of secretion and swelling. It is well known to you that a perforation of the membrana tympani by no means necessitates or involves a high degree of hardness of hearing, although you will often find an opposite view taken, not only among the laity, but also in the profession. Commonly the hearing, in consequence of the perforation of the membrana tympani, is so affected that a watch which may be heard for six feet in normal hearing, can only be heard from one to two; but this leaves sufficient hearing for ordinary purposes. I know several persons with perforation of the membrana tympani on both sides, and yet so little disturbed by it, that they do not pass at all for deaf persons, or as hard of

* Vide *Virchow's Archives*, B. 21, 3*d* Hft.

hearing. Even a complete loss of the membrana tympani does not entirely destroy the hearing, although it suffers severely therefrom. Patients generally hear better with a perforation of medium size, than with a very small one; but every perforation of the membrana tympani must be regarded as of moment, and has the following importance: that is, that thereby the mucous membrane of the cavity of the tympanum has lost its natural protection, and is open to atmospheric influences, and will be retained in an irritated condition, which may increase to an acute affection of more importance. The perforation is generally the reason that a chronic otitis, with otorrhœa, often remains permanent—a radical cure not being possible.

Such forms of disease often run a course of years, without any further consequence than that the patient has a discharge from the ear, and is somewhat hard of hearing; and this condition does not receive the amount of attention which it demands, especially if it be but on one side. The discharge varies at different times in degree and kind, and sometimes disappears altogether for a time. The surgeon is generally first called to see such a case when, after a cold or injury, an acute and painful condition is present. If we except those cases where important complications (such as ulceration of the bones) have occurred, the pain and other symptoms in such a subacute otitis interna are less than in a primary otitis; because, in consequence of the perforation in the membrana tympani, there is seldom any great amount of secretion in the cavity of the tympanum—it being able to pass out, if the opening be not accidentally closed by a mass of epidermis. If neglected and left to itself, chronic otitis interna may lead to the formation of polypi, to caries, and to various disturbances, of whose great importance for the life of the patient we will speak more fully.

We are often able, by proper and long-continued treatment, to bring such a process to a stand-still—to lessen the purulent discharge and hyperæmic swelling of the part; and we often, also, obtain with this a considerable improvement in the hearing.

The treatment must be directed to the end of reducing the hyperæmic swelling of the mucous membrane of the cavitas tympani, and to render its secretion normal.

Diligent and thorough removal of the secretion is especially important.

The necessary injections with luke-warm water must be made very carefully, since a heavy stream from a large syringe can easily do great damage, in the sensitive and loosened condition of the parts. Sometimes, when the greatest precautions are taken, vertigo and fainting fits result from these injections. It is well to fill the ear with warm water some time before the injection, so that the secretions may be made as loose as possible, and a small stream be sufficient to remove them. In some cases, the end of cleaning the ear is better attained by the use of a small camel's-hair brush.

A thorough removal of the secretion is very difficult, when the opening into the cavity of the tympanum is small and we can only inject a small quantity of water.

The patient, in such cases, should endeavor to pass in air through the Eustachian tube, so as to drive the secretion forward, where it will be more accessible. In such cases the dropping in of astringents is of comparatively little use, while in other cases, by constant and diligent perseverance with them, we may be able to bring the mucous membrane again into a healthy condition. It is highly beneficial to often press air into the middle ear by means of the catheter, because in this way we can most thoroughly remove the secretion, and keep the canal open. I have no good result from the use of the vapor of ammonia, but I have seen great benefit from the vapor of warm water. We must never, in these cases, lose sight of the condition of the mucous membrane of the pharynx. Frequent gargling is of great service, for by this means we increase the power of the canal, and favor the discharge of the secretion.

The constitutional treatment must never be neglected—especially the use of properly-adapted mineral waters; change of air, residence in a warm climate, often having a beneficial effect on a diseased mucous membrance. (Great attention should be paid to the diet of the patient, especially when this affection occurs, as it does in the large majority of cases, in the half-nourished children of our poorer classes in New York. The physician will find the patients living on slops and poorly-nourishing vegetables, such as cabbage, and a change to bread and milk, fresh meat and eggs, etc., will work wonders. Let us never let local symptoms shut out our view of the constitutional cause, which proceeds all the trouble.)

It has occurred in my practice, that patients with such a chronic blennorrhœa of the cavity of the tympanum, whom I had treated for a long time with very little result, have returned from a trip to Madeira nearly cured, or in such a condition that proper local treatment had soon a good result.

The local treatment must be continued for a long time, even when there is no more evident discharge—at most, only a slight one, whose seat is very deep. We should only observe the precaution to allow a considerable interval to elapse between the syringing and the dropping in of astringents.

Under favorable circumstances, we are often able, by these simple means, to bring the process to a full stop, and to close the opening in the membrana tympani.

To those who doubt that perforations of the membrana tympani will heal, I would like to adduce cases in my own experience, among which are those of two members of our profession. Some cases occurred to me, when I was obliged to refer back to the history of the case, in order to see in what part of the membrane there was previously a perforation, so little trace of it remained. I once examined such a healed perforation on the dead body.* In this case the microscope revealed that there had been a loss of substance, and that a spot a little thinner than the remaining portion of the membrane was a cicatrix. In practice, we may quite often see such cases on the living. The cicatrices are generally seen as thin, sharp-bordered, superficially sunken-in spots, which sometimes have a peculiar, diffuse, mother-of-pearl-like reflection, and which, on blowing in upon the membrana tympani, stretch out in their full dimensions.

If a perforation should close, the patient will likely not hear so well immediately after; but we must not attempt to prevent the closure. If we open a freshly-healed perforation, the patient will hear better for the moment; but, on the other hand, if we leave the cicatrix alone until it becomes firm, the hearing will either gradually improve of itself, or from the introduction of warm air. This must not be attempted for some time after the healing, and then must be done with the greatest care, lest an otorrhœa be excited. The closure of the perforated membrana is the most desirable and permanent means

* See *Virchow's Archives*, vol. 17, p. 16.

of improvement, and our treatment should be directed to securing this end.

We must avoid, however, lessening the size of the opening until we have bettered the condition of the cavity of the tympanum, and the mucous surface of the membrane, or we shall not have improved the state of things, but, on the contrary, have made it worse, because, by so doing, we shall have rendered the way out of the pus more difficult.

We must always remember that we are dealing here with a fistulous opening, which will heal with very little aid, so soon as the morbid condition of the fistulous canal is removed; but that we will render the condition of things worse if we close the opening without healing the canal, because the accumulation of a mass of pus, with all its consequences, is thereby induced. We can best attain the desired end of healing the fistulous canal by means of appropriate treatment, as given above, and we can aid the growth of new substance by a careful, well-watched irritation of the edges of the perforation.

Many authors speak of very favorable results from such a treatment alone, *i.e.* touching the edges with solutions of nitrate of silver, etc. Even in old cases, and where considerable loss of substance has occurred, so far as I have practised this treatment, I cannot especially recommend it. In one case I made the opening larger instead of smaller, although I exercised the greatest care.

I should only like to use this treatment when the opening is very small, and the patient could remain under constant observation. It is certainly a rational treatment in theory, for we occasionally see a lessening of the opening begin after an accidental inflammation of the part.

In order to diminish the evil results occurring from perforation of the membrana tympani, it has been often attempted to insert an artificial membrane, and thus close the opening. The first recorded experiment of the kind was made by *Autenreith* in Tubingen, who, in 1815, advised the placing of a short elliptical leaden tube in the ear, over the end of which a piece of the bladder of a small fish was placed, drawn over while wet, and after drying varnished. How far this experiment succeeded, I am unable to say. In later times, *Toynbee*, of London, in 1853, recommended an artificial membrana tympani, consisting

of a thin plate of vulcanized india-rubber, in the centre of which a fine silver wire, about an inch long, is fastened, which has a ring on its outer end, by means of which the instrument can be easily removed. Such an artificial membrane is pressed against the remains of the natural one, and sometimes causes a truly magical effect.* I have seen cases where conversation could not be heard unless the voice were elevated in close proximity to the ear, so much improved, that some steps off each softly-spoken word could be repeated by the patient. In cases where the perforation is very small and very much of the membrane remains, the artificial membrane often causes too much irritation, and its use cannot be continued when there is any evidence of recent inflammatory action. We can never tell beforehand whether the instrument will do any good or not, and we must seek by repeated attempts to find the place where it improves the hearing the most.

Fig. 9.

In what manner the often striking benefit from the use of the artificial membrana tympani occurs, we cannot exactly say. It seems to me that there are various ways in which it may do good. It is certainly seldom beneficial from the mere closure of the cavity of the tympanum, which Toynbee gives as its mode of effect. It often improves the hearing when its edges are so folded and everted that there is no perfect closure of the cavity, and it sometimes causes no change in the hearing power if a portion of it be cut off. In all cases the improved condition of the hearing is accompanied by the advantage that the mucous membrane is guarded from the effects of the atmosphere, and I often use the gutta percha only for this purpose. In this case the silver wire can be shorter, for it is not necessary that it should be introduced so far as to rest upon the remains of the membrana tympani. That the improvement in hearing by the use of Toynbee's instrument did not depend on the closure of the cavity, I was able to prove by the use of collodion, which closed the cavity without benefit to the hearing, which was immediately benefited by the disk of gutta percha being introduced, or any other

* Vide *Diseases of the Ear*, by Toynbee, Philadelphia ed., p. 191, et seq.

firm body. In the most cases it seems to be the pressure on the membrana tympani, and on the handle of the malleus, which causes this sudden and wonderful improvement. This opinion is sustained by the fact that the same effects are produced which are obtained by the introduction of Toynbee's instrument by the use of a little ball of moist cotton, which is pressed on a certain part of the drum. *Yearsley*, of London, in 1848, first recommended this procedure, and it is to be preferred to the gutta percha where the latter proves irritating, or a considerable purulent discharge is present. By the use of an astringent with the cotton this may often be diminished. Many patients are able, after a few attempts, to place the cotton on the right point. In patients who are less intelligent, the plate of gutta percha is to be preferred, because it is easier to introduce, and when it is misplaced it is easy to bring again into its proper position. Frequent cleanings of the ear by means of injections are the more indicated, because the use of the instrument tends to increase the secretion and irritation. Yet, when care is taken, the irritation caused is very slight. I have occasion, from time to time, to hear of patients who have worn this instrument for years, and always with undoubted benefit. The instrument must now and then be replaced by a new one, since, after the use of months, it is unfit for its purpose. We can imagine the changes which would be likely to occur from the pressure of this foreign body on the membrana tympani and the handle of the malleus, and which, according to my view, generally is the cause of the improvement in hearing.

We remember that in a purulent inflammatory process there is a solution of the continuity of the ossicula auditus. This occurs most commonly in the articulation of the incus and stapes, whether it be by simple loosening of the soft capsule of the joint or by means of a loss of the long process of the incus, which, as we have seen, is sometimes destroyed by caries. When the membrana tympani, with the incus, is pressed against the stapes, the continuity will be restored. *Erhard*, of Berlin, author of the Rationnelle Otiatrik (a queer book), claims to have been the first to have found the method of curing deafness by pressure on the membrana tympani on his own ear, and to have published it in '49, without knowing of Yearsley. (I saw in one of Dr. Erhard's cases, at his office in Berlin, a most remark-

able instance of improvement in hearing by the placing in of cotton. In this case the patient, a boy of about 14, had learned to place it in itself. I was unable to adjust it as well or as quickly as he could do. Recently I saw a case of like character, though not so marked, in the improvement shown, under the care of Dr. Noyes in the New York Eye Infirmary.)

These changes, affecting the little bones of hearing, which would seem to be so seldom, are not as rare as we would naturally think. In Toynbee's catalogue of preparations of the ear, among the great number of sections which he has made, the entire loss of the incus occurs four times. Its long process was wanting ten times, partially or fully, and fifteen times the articulation between incus and stapes was lost. I myself found the last state of things three times on the dead body. In one case I was not able to get out the bones till eight days after death, and the changes which occurred may have been only macerative, the cavity of the tympanum being filled with pus. The other cases cannot thus be explained, for on opening the cavity there was no trace of injury. Such a separation of the delicate connection between incus and stapes can occur during life by means of a severe concussion of the head, and especially by means of a sudden change in the pressure of the air in the middle ear, similar to the manner in which a laceration of the membrana tympani may occur. Recall to your mind only what we observed in this respect in our observation of the physiological importance of the mastoid cells. Collections of purulent exudation can produce such a result by ulceration, and the whole chain of bones may pass out. Further, a gradual or sudden tearing of the delicate membrane may occur by means of a strong expiratory effort, when a spurious anchylosis, by means of adhesive bands, has rendered the parts inflexible. The last named condition obtained in my ten cases, and in a number of those of Toynbee.

As the separation between incus and stapes by no means occurs only with purulent deposits in the cavity of the tympanum and perforation of the membrana tympani, so the improvement in hearing by pressure on the membrana tympani may occur in persons where this is entirely uninjured. I have seen one such case, where the introduction of a little wad of cotton improved the hearing for one day in a remarkable man-

ner, and in the recent and ancient literature, you may find numbers of cases related, where patients hard of hearing have accidentally found, that by introduction of a foreign body in the ear they could temporarily improve the hearing. As such assistances to hearing all possible things have been used:—pencils, paper, shavings, onion bulbs, lint, etc. One of the most interesting of these cases is related by *Menière*, a distinguished and excellent Aural Surgeon.*

An old judge had been accustomed for at least 16 years, by pressure of a blunt, gold needle against the membrana tympani, to make for himself, for an hour or so, a tolerably good hearing-power. Menière examined the ear during this state of things, found the membrana tympani uninjured, and that the pressure was made upon the handle of the malleus, which was pressed somewhat inward. He speaks of having seen several similar cases, and considers them cases of nervous deafness, which were improved to a certain degree by pressure upon the ossicula auditus, and through them on the labyrinth.

* Traité des Maladies d'Oreille, par Kramer, traduit par Menière. Paris, 1848, p. 526.

LECTURE XX.

AURAL POLYPI.—A FULL CONSIDERATION OF THE IMPORTANCE OF DISCHARGES FROM THE EAR.

Origin and Structure of Aural Polypi.—Treatment.—Otorrhœa, considered with reference to its Influence on the Circulatory System.—Emboli.—Septic Infection.—Metastasis.—Caries of the Temporal Bone, with its Consequences.—Phlebitis.—Abscess of the Brain.—Meningitis Purulenta.

GENTLEMEN—I have already alluded to aural polypi as among the consequences of otorrhœa. We will to-day undertake a short description of these morbid growths.

Aural polypi may be described as swellings, rich in blood, and consequently bright red in color, of somewhat round shape, sometimes of a soft consistency, and bleeding on being touched; sometimes dense in structure, and with a shining surface, generally grape-shaped, or lobulated, and sometimes having a large base, and sometimes a small one,—pedunculated. They vary greatly as to size, sometimes filling up the whole auditory canal, extending out of the meatus like a fungus or mushroom. Sometimes they are found covered with pus and secretion lying in the deepest part of the ear, and scarcely so large as a pea. If lying deeply, they are redder and softer, and resemble a strawberry, since its round superficies is covered over with minute elevations. If it extends out of the meatus, it will be covered with a thick integument, which does not secrete, so that at first sight we are apt to think it a part of the auricle, or that it is a button-shaped tumor, which has formed upon it.

Aural polypi take their origin from all parts of the auditory apparatus. According to my experience, they rarely arise from the external auditory canal. *Toynbee* and *Wilde* have found their most common origin to be from the canal, and the last named on the posterior wall, but they extend very often from

the membrana tympani upon the canal, and we may sometimes see numbers, with independent roots, attached around about this region. If they arise from the superficial surface of the membrane, it is generally from the posterior and upper portion of this membrane near its edge.

I once found, on the dead body, in connection with a polypus of the external auditory canal, and of the Eustachian tube, what in accordance with its position and microscopic structure proved to be a polypose, degenerated membrana tympani.

I have also, on the living subject, met with excrescences, the form and extraordinary sensitiveness of which led me to regard as enlargements of the membrana tympani.

Aural polypi arise most commonly from the mucous membrane of the cavity of the tympanum, and from the upper portion of the Eustachian tube. Very often growths, which half fill the auditory canal, have their origin just behind the membrana tympani, even partly in the mucous surface of the membrane itself. I have some preparations showing this. If polypi extend out into the auditory passage, through a hole in the membrana tympani, they make almost the same impression as if their origin was in the membrana tympani itself, and mistakes as to what point they actually arise from may often occur.

Developed granulations of connective tissue are often comprehended in the term aural polypi, and practically we can make no distinction.

Among the aural polypi which I have examined, only a few appeared with hollow spaces on section, among these was the above described degenerated membrana tympani. The cavities were filled with detritus and fat cells.

The others were of homogeneous structure, and their papillary structure could be detected on the external surface.*

They do not always possess ciliated epithelium, as has been said, but this variety may be sometimes distinguished in the various lamellæ, in the deeper structure, when on the external surface none is detected. The lamellated structure is best seen by examining the growth under water.

We are not yet able to say if polypi may be developed in a healthy ear, or in a case of simple catarrh of the cavity of the tympanum. It is probable, that they have their origin only

* See Virchow's Archives, vol. 16, p. 71.

after a long continued purulent process. It is also certain that an otorrhœa may be maintained for a long time by such a polypus, since this will secrete pus very freely, and continue the morbid tissue beneath in its irritated condition.

Otorrhœa, which we cannot check by local treatment and cleanliness, will be often found connected with excrescences, which, be they never so small, can explain the duration of a chronic inflammation of this kind. If you remove them, the inflammation immediately closes as if cut off.

Blood is often mingled with the pus in varied proportion.

Such growths can grow very rapidly and to a great size. Thus, I had a case in a young man with an exacerbation of otitis interna with perforation, whom I allowed to go home after the subsidence of the acute symptoms, when in six weeks a polypus formed, reaching out to the meatus, and of which there was not the slightest trace when I last saw him.

Treatment.—We can remove very small growths by means of repeated applications of nitrate of silver, even larger, by penciling with acetic acid, with tr. opium, with the infus. or tr. cantharides, or with creasote, we may cause to shrink away, entirely or in part. Such procedures are slow, unsafe, and, when with creasote, very painful.

When it is possible, I would advise the resort to an operation, and I do not know any instrument for removing them better than Wilde's polypus noose or snare, which I now present to you.

This consists substantially of a steel shaft, making an angle at the middle; before the bending from its handle it is quadrilateral, in order that a cross-piece may be moved upon it. A fine wire is run from this cross-piece the length of the instrument through rings at the side. The handle has a half ring for containing the thumb, by means of which the whole apparatus is held, while the cross-piece is drawn back with the index and ring-finger.

The handle and cross-piece are made of German silver. Wilde recommends a steel wire, but I use one of silver, as not rusting so easily. When we have ascertained by means of a sound the position and depth of the polypus, we make a noose of the wire, just large enough to encircle the base of it. We then pass the instrument in, and the noose about the tumor,

and by means of the cross-piece draw the wire back, and thus cut through the polypus. The hæmorrhage consequent on the excision is generally considerable. After the ear is syringed out, we examine it anew, and often find another polypus, which we should attempt to remove immediately.

When these polypus growths extend very deeply in the ear, the integument of the auditory canal is commonly swollen and excoriated, so that in consequence of the increased narrowness and sensitiveness of the part we are not able to pass the noose to the bottom, and are obliged to remove the excrescences piece by piece. Since considerable hæmorrhage arises after thus cutting off a piece, the subsequent examination and re-application of the instrument will be impossible, and we will be obliged to subject the patient to several sittings in order to remove the whole of the morbid growth.

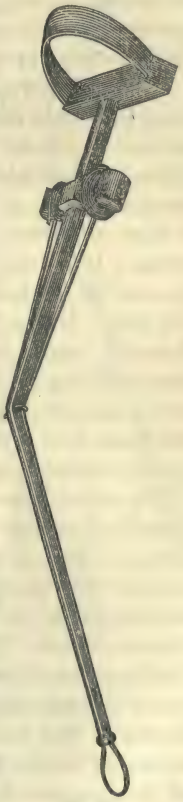


Fig. 12.

We learn the value of Wilde's instrument in removing a granulation, no larger than a pea, which may rest on the membrana tympani itself, and which on account of smallness and deep position we can scarcely reach. In any other way of removal we run the danger of severe pain to the patient, and of injuring the membrana tympani, but with this noose introduced through the speculum, and lighted with the concave mirror, it can be removed close to the base in a moment of time. As I have said, I prefer this method of removal with Wilde's noose to any other, and in only one instance, where a long existing, dense, and thick polypus reached out to the meatus auditorius externus, did it fail me.

No wire could cut through such a hard body, as this was. I could not bring scissors or knife to my assistance, and it seemed to me a too formidable operation to be undertaken with the polypus forceps or pincers. We can never tell beforehand where

polypi of the ear have their origin, and with the forceps we may remove a portion of the wall of the cavity of the tympanum, or membrana tympani.

It may be that the use of this last-named instrument has taught many authors to consider the removal of aural polypi dangerous, and causing them to warn the profession from attempting the operation—for the pincette or forceps are almost generally used, and in many cases what comes in their grasp, be it polypus or no, is dragged out.

As many polypi as I have removed, I have never seen other than favorable results. In one case, there was a relief from a sensation of cerebral pressure after the removal of the growth. Even in cases where there is caries of the petrous portion of the temporal bone, and the polypi are nothing less than little warts, I have no hesitation in removing them in one way or the other. It is true, however, that by these removals we cannot protect the patient from a fatal result, especially if we operate too late. If the polypus be removed to a certain depth with the wire noose, then the roots can be removed by cauterization with the nitrate of silver after we have cleared the auditory canal of all secretion, and dried it by means of cotton introduced with a forceps, or we can bring the remainder to a gradual shrinking process by the use of astringents.

We should never omit such an after treatment of polypous growths, else there will be soon a new formation in place of the old one. This is the more necessary, when a portion remains in the cavity of the tympanum, in the depth of which there can be no thought of an operative expedient, at least only to a very limited degree. If the different portions of the swollen tissue at last separate themselves by cleanliness, and the use of astringents, we can remove one or the other of the excrescences by means of the noose or caustic. I use a very small piece of nitrate of silver for cauterizing the middle ear, and by means of the caustic-holder here presented.

It is astonishing to what a degree sometimes even old and severe cases can be improved by means of such a subsequent treatment. It has been advised to remove the whole of such polypi by means of cauterization, especially with Vienna paste in the stick, or with chloride of zinc. I confess I do not consider fluid caustics, whose effects you cannot limit, as

applicable for the ear, for the parts can be thus easily injured, and unnecessary pain caused. Menière mentions that he has seen necrosis of the bony part of the auditory canal occur, when the parts have not been enough guarded.

Otorrhœa.—This is by no means a disease of the ear by itself; it is only a symptom, an evidence of disease,—and one that occurs in various pathological processes. We will now once more consider the whole subject of otorrhœa from a practical stand-point in its full importance and common results.

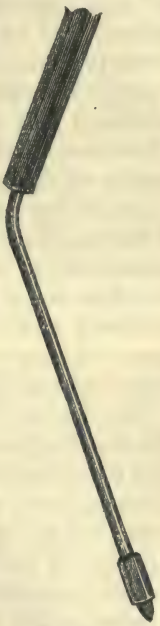


Fig. 13.

Otorrhœa occurs after acute and chronic otitis externa, myringitis and otitis interna, as well as from furuncles in the auditory canal, in other words both in external and internal affections. Aural polypi may be considered as sustaining causes of otorrhœa, although they are properly results of inflammatory affections of the ear.

Purulent discharge from the ear is a very common complaint, especially in children. This may be accounted for by the fact, that it is developed in so many different diseases of the ear. It is generally left to itself, and therefore lasts a great while. (Among 512 cases, treated at the New York Eye Infirmary by Drs. J. H. Hinton and Henry D. Noyes during the year 1862, 107 are classified as otorrhœa externa, 6 as otorrhœa interna, more than a fourth of all the cases presented.)

Otorrhœa is generally, both by the laity and professional men, considered of no particular importance, and thus it comes to be neglected. Sometimes it is even thought the health would be injured by checking the discharge.

In opposition to this general opinion I have often in the course of our meeting together called your attention, not only to the importance of every discharge from the ear, for the affected organ, but also for the general condition and life of the patient. In this last-named view we will now consider otorrhœa, and the more minutely, since the importance attached to the subject here in Germany is exactly the opposite from

what it claims. (Also true of the United States. It was only a few days since that a man in good circumstances, and more than ordinary intelligence, came to my office, complaining of vertigo and other head symptoms, which I could make nothing of until I questioned and examined him as to his ears, ascertained that he did not hear well from one, had a discharge from it at intervals for 12 or 14 years, and yet did not think it worthy of mention. I found a perforated membrana tympani, he could only hear the watch one inch from the meatus, and there was a slight purulent discharge, having its origin in the cavity of the tympanum; other ear normal.)

As is the case with every bone of the skull, the temporal bone stands in the closest relations with the endocranium by means of the vessels of the diploë, connecting as they do with the dura mater, and its venous sinuses. The integument of the auditory canal and membrane of the middle ear stands in the same relation to the bones which they cover, being as it were their pericranium.

The purulent inflammation of the ear has a great importance for the whole organism, in consequence of the relation in which the blood-vessels of the dura mater stand to those of the ear, because here, and in the diploë, and in the other cellular structures of the temporal bone, we may often seek for the point of origin of various constitutional troubles, which declare themselves under cerebral, typhoid, and pyæmic symptoms, and which appear on the post-mortem table as metastatic abscesses and deposits, and as ichorous deposits.

In all times surgeons have known that every slight appearing injury of the skull in its hard or soft parts is to be seriously regarded, because it often leads to abscesses and inflammations in far removed organs, which may have a fatal result. For some time it was thought, that this was due to a participation of the diploë in the affection. Now by means of the labors of *Virchow*, which have broken an entirely new way to the field of science, and made an epoch therein, we know that next to the veins of the lower extremity, and of the pelvis, there is no part of the human body, so favorably circumstanced for the formation of blood-clots as the blood-vessels of the dura mater, and the net of capillary vessels communicating with them, which pass through the cellular structure of the bones of the skull,

filling them to a great extent, and thus making them organs rich in blood.

The importance of the osteo-phlebitis of the diploë, which is so feared by the surgeon, is from purely mechanical causes, that is, the vessels of the diploë, if not every where, are here and there united to the unyielding wall of bone, and consequently thrombi are more easily formed, which extend thence into the sinuses, at length are washed out from here, and excite metastatic inflammation in the stream of the pulmonary vessels, being wedged in there.

Moreover, purulent masses remain very easily in such small cells, and finely washed spaces are broken in pieces, and then form, with the aid of extravasations which often form there, a foul herd of infection, from which the blood is infected, and the well-known metastases in the cavities of the pleura and joints are excited.

If, however, when we speak more exactly, a great part of the hollow and meshy space of the temporal bone is not to be reckoned as diploë, since they contain air, and do not contain the thin fluid marrow of the bone, shut in by a narrow set of vessels, yet, notwithstanding, we are dealing here with very similar anatomical conditions, and we are in free connection with the air, just on the other side of the hollow spaces of the petrous bone, especially when perforation of the membrana tympani exists, which, as is well known, forms the going on of a pyæmic process.

The petrous bone of a child, however, consists almost entirely of diploë. In England, it has been for a long time shown how often patients suffering from otorrhœa, die in consequence of purulent pleuritis, with pyæmic symptoms and with lobular abcesses of the lungs, and that phlebitis of the cerebral sinuses of the jugular was an explaining accompaniment.

Lebert first called our attention in Germany to these common results of the inflammations of the ear,* and attempted to show the deleterious influence of the phlebitis on the blood channels, since from this point out, the inflammation must extend to the membranes and the brain, or to the jugular vein and lungs.

* Virchow's Archives. B. ix. 1855.

According to Lebert, the inflammation first declares itself by a chill which suddenly occurs in the course of an otorrhœa, in connection with other symptoms of an incipient typhoid fever. Generally such cases are considered as true typhus. The pain in the head is much severer, however, confined to one side, and is increased on pressure. There is often delirium according as are the pain and symptoms of depression. Just so, the symptoms of weakness and paralysis of the limbs are of a weak and oscillating character. All the peculiar typhus symptoms, such as roseola, ilio-cæcal pain, enlargement of the spleen, diarrhœa, typhoid bronchitis, etc., are wanting.

The indolent or weak character of the malady, as it reaches out with regularly accelerated pulse, into the first and second week, as well as the continued, or at least, occasional pain in the ear, gradually calls attention to the ear and brain. If the course of the affection be not to sudden death in the form of meningitis, in the course of the second or third week distinct pyæmic symptoms appear. The chills have so distinct a character, that many physicians diagnosticate intermittent fever, but a regular interval never appears, while the typhus exhaustion, the cerebral symptoms, and the remarkable weakness of the pulse continue, and gradually the symptoms of metastatic abscesses in the lungs and joints appear; sometimes they appear also in the subcutaneous connecting tissue. In the first stages of the disease, there is a tendency to constipation; later on, diarrhœa occurs; the evacuations are irregular; and death, in a comatose condition, generally occurs.

The course of this disease is either a rapid and acute one, which we might call the meningitic, because the central symptoms are most prominent; or it is of a typhoid and pyæmic character, malignant to the highest degree, lasting to the fourth or fifth week.

Virchow has taught us since then, that the putrid material in the blood, and not the phlebitis, although of course assisted by this, is the chief cause of the disease; however, I have thought it well to give *Lebert's* description and ideas of the disease in full. It must be clear to you, that these described consequences of otorrhœa, whose origin may be deduced from emboli and septic infection, that is, from the circulatory system, can appear without any caries of the temporal bone.

If we turn now to caries of the temporal bone, as a far more common result of purulent discharges from the ear, we find that we have already experienced why an ulcerated process in the underlying bone, so easily forms from a purulent inflammation of the soft parts covering these bones. We have also found, that in almost every case of caries of the petrous bone, we are not dealing with a primary disease of the bone, but also with the consequences of a regulated and long-existing purulent inflammation of the soft parts; and that in every otitis externa and interna, when the purulent discharge is not gradually diminished, the bone always takes part more or less in the ulcerated process. Carious affections, on whatever part of the body they may take place, as is well known, exert a great influence upon the whole organism, and are esteemed as very important by every member of the profession, as affections which not only excite great local changes and deformities, but which often bring the life of the patient into danger by means of the blood poisoning, and often leading to a weakened and deteriorated condition of the internal organs.

Caries of the vertebræ and of the bones of the head, are especially to be considered dangerous. No bone of the skull is so often in a carious condition as the temporal, and the peculiar structure of the bone is an especially unfavorable circumstance, so that the prognosis of the caries with its accompanying otorrhœa is peculiarly gloomy.

In the seventh lecture, in speaking of the external auditory canal, I called your attention to the little distance of the dura mater and brain from the upper wall of the canal, the nearness of the mastoid process and posterior wall to each other; and this explains why these parts are so easily brought into a state of inflammation. Still more important is the proximity of the parts in the cavity of the tympanum, since its lower surface, or wall, has only a thin plate of bone separating it from the internal jugular vein, the largest vein in the head. The largest artery of the head, the internal carotid, runs along its anterior portion, again, only separated from a soft and often wanting plate of bone; furthermore its roof, or upper wall, lies between a covering of mucous membrane, and the dura mater, and the sinus petrosus superior. This plate of bone is often thinned and even perforated, and often con-

tains, even in adults, an opening—*fissura petrosa squamosa.* Finally, the internal wall, or wall of the labyrinth, offers but slight resistance against an extension of the inflammatory process upon the internal ear, and with it, upon the internal auditory canal, which is lined with the coverings of the brain.

Now, I ask, gentlemen, if you know a cavity in the human body, and such a small one, which borders in a similar manner upon so many important organs, and in which we should so anxiously regard purulent processes and their common consequences? However, we do not speak here from a merely theoretical and opinion stand-point, but our practical experience shows us, and every surgeon knows, that caries of the bones of the ear very often excites affections dangerous to life. This change in the vessels and in the blood which we have described, occurs quite often; besides, we furthermore observe inflammation in the walls of the vessels, the real phlebitis, which sometimes leads to perforation of the vessel and extravasation. Considerable hæmorrhage has been observed to occur from the ear, in consequence of ulceration of the neighboring vessels; not to speak of the very slight ones which give to the pus in otorrhœa a dark color.

Inflammation of the brain-substance, the formation of abscesses in it, and purulent meningitis, accompanied by changes in the structure of the upper wall of the cavity of the tympanum, have been observed as the most common of the effects of caries of the temporal bone. According to *Lebert*, who has called our attention to this origin of abscesses in the brain, as in the ear, about one fourth of these abscesses have their origin in caries of the petrous portion of the temporal bone.

If we look at the cases of abscesses in the brain, scattered here and there in the literature of aural surgery, we will be satisfied of their origin, and there is an urgent necessity in every post-mortem of such a case to follow *Lebert's* advice, and examine as to disease of the ear. As a rule, there will be found healthy brain substance between the external surface of the petrous bone and the purulent masses in the brain, and the dura mater on the tegumentum tympani (a thin plate of bone forming the upper wall of the cavity of the tympanum) is considerably thickened. Much more rarely the deposits of pus are adjoining, and thus they have the appearance of being metastatic.

This is not the place to go any further into the symptoms of abscesses of the brain. I would only recal to your mind, how great changes may take place in the brain unaccompanied by fever, and with no disturbance of the functions, and especially of the intelligence. Severe local pain increasing on pressure, is often for a long time the only symptom of an otherwise entirely latent affection of the brain, and death sometimes occurs very suddenly and unexpectedly with convulsive or apoplectic symptoms. (At the meeting of the New York Pathological Society, held January 23, 1860, Dr. T. G. Thomas, presented a specimen of abscess of the brain, resulting from otorrhœa, which I condense somewhat and insert here :) " A girl about fourteen entered Bellevue Hospital on Monday, January 23, general health had been good, except that she was subject to an occasional slight otorrhœa and convulsions, which were clearly of a hysterical nature, which had existed for a year. On the seventeenth of the present month, she was seized with a violent pain in the ear, which ceased on the twenty-first, and pus was discharged.

" Headache complained of, and pain along the course of the spine ; vomiting and occasional delirium set in ; convulsions continued.

" She died in a few days, and the diagnosis between profound hysteria and abscess of the brain was not established till the post-mortem.

" Abundant traces of pus were found at the base of the brain. At a point just above the petrous portion of the temporal bone there were fluctuations, and about one drachm of pus was evacuated. On incision, pus, on outer surface of the brain, evidently resulted from local meningitis."

" Dr. Bibbins referred to a case which he saw while on Randall's Island hospital : A little child had otorrhœa with more or less hemiplegia. The Doctor noticed a suspicious purplish appearance behind the ear, which looked as if some portion of the mastoid process were about to exfoliate ; the child was doing well, not confined to bed, was suddenly seized with a convulsion and died.

" Post-mortem showed a large abscess of one lobe of the cerebellum."

(These two cases are full of interest, and amply justify all

the urgency with which the author insists on a careful consideration of the ear in all brain symptoms.)

Otitis and otorrhœa quite often lead to purulent meningitis; and here the anatomical condition allowing the transfer of the affection, is commonly clearer and less doubtful, than is the case with cerebral abscesses. The inflammation of the cavity of the tympanum can extend in two ways upon the coverings of the brain, either through the tegumentum tympani, that is, upwards, or, inwards, by means of the meatus auditorius internus.

Inflammation of the roof of the cavity of the tympanum, and consequently of that part of the dura mater over it, is by far the most common result of caries of the ear, as is shown by post-mortem sections. This may arise, in good part, because this portion of the base of the skull and its changes, may be more readily seen in an examination of the dead body, while many other changes must be carefully looked after by removal of the temporal bone. We may, then, question if they really often occur, or are only most often discovered.

I recall to your mind the fissure in the bone which exists in the roof of the middle ear, and in the *tegmen tympani*, and to the arterial branch, and the process of tissue which pass through this fissure from the dura mater to the mucous membrane of the middle ear, and by means of which, each nutritive disturbance in the cavity of the tympanum and mastoid process will exert a certain effect on the dura mater. I call, further, to your mind, the thinning, or rarefaction of the bone, which we have found to be quite common here, and which may thin the tegmen tympani even to perforation, without any declared caries of the bone. It is clear that in a case where there is very little, or, perhaps, no substance intervened between the mucous membrane and the dura mater, an extension of the inflammation is doubly easy to occur.

The cases, when year-long existing otorrhœa has ended fatally, under the form of meningitis, while the roof of the cavity of the tympanum was not attacked, but the disease had extended from the internal auditory canal, occur very often in surgical literature. Very often, however, an exact anatomical description of the intervening parts is wanting. In the cases which have been carefully examined, the inflammation

and purulent discharge extend from the middle ear to the labyrinth, and upon the meatus auditorius internus. The wall of separation of middle and internal ear, the labyrinth wall of the cavity of the tympanum, is thin, and has in it two fenestræ, vulnerable points, through which extension of morbid processes is very easy. *Itard* * speaks of such a case; and I can show you another where the fine ring-shaped band going about the base of the stapes, was affected, and thus the purulent process found its way into the labyrinth. There are also many other preparations illustrating this point, especially those from Toynbee. If once the vestibulum and cochlea be affected, there is nothing between the inflammatory mass and the meninges, but a finely permeated lamella of bone, through which the auditory nerve sends its soft, hair-like threads into the labyrinth, and thus, in the majority of cases, when the labyrinth is invaded, the process extends on to the coverings of the brain.

* Traité des Maladies de l'Oreille. 2 Ed. 1842. Tom. i., p. 210.

LECTURE XXI

FURTHER CONSEQUENCES OF OTORRHŒA.—ITS PROGNOSIS AND TREATMENT.

Facial Paralysis. — Tuberculosis and Cholesteatomata of the Petrous Portion of the Temporal Bone.—The uncertain Prognosis of Otorrhœa.—The Incision behind the Ear, and Perforation of the Mastoid Process.—Prejudice against Local Treatment. —(A Case reported by Dr. C. R. Agnew.)

GENTLEMEN—We saw, in our last meeting together, what a great number of changes in structure may be developed from a purulent process in the ear ; that meningitis purulenta was one of its common results, caused by an extension upwards of the carious process upon the roof of the cavity of the tympanum ; or, indeed, through the vestibule and cochlea. There is still, however, a third way.

It is well known to you, that occasionally, inflammations extend from one point to another along the course of a single large nerve, under the form of a peri-neuritis,—an inflammation of the sheath of the nerve.

A continuation of an inflammatory action may extend from the cavity of the tympanum, even when the integrity of the labyrinth is perfect, through the fallopian canal along the facialis nerve, and this nerve is very often involved in the affection. To my knowledge, no such connection between otorrhœa and meningitis has previously been observed.

The anatomical considerations of the parts show us, that the facialis must be often affected in otitis interna. Sometimes the facial nerve runs for a considerable distance on the wall of the cavity of the tympanum, and is only separated from its mucous membrane by a thin, transparent lamella of bone. Sometimes, again, the stylo-mastoid artery, which supplies the greatest part of the membrane of the middle ear, takes its

way through the fallopian canal, and gives branches to the sheath of the facial nerve.

Facial paralysis, of various grades, coming after convulsions of the muscles of the face, occurs in the course of inflammation of the ear, and perhaps a part of the so-called rheumatic facial paralysis, on more exact examination, will be found connected with affections of the cavity of the tympanum. Experience teaches us, that there is no such unfavorable prognosis for this affection, as is often given even in our best text books of nervous diseases. Even very extended facial paralysis disappears under treatment, and we are able to bring the process in the ear to a standstill.

I have seen quite a number of recent cases of one-sided facial paralysis fully cured by means of the simple treatment which we have learned for otitis.

Moreover, we see from the described anatomical conditions, that the appearance of paralysis of the facial nerve, in the course of an otitis, has, by any means, danger for the life of the patient; for we cannot, therefore, conclude, that the brain is taking part in the affection. Great interference with the circulation and increase of secretion in the cavity of the tympanum, can react on these nerves. Moreover, caries, of the soft lamella of bone, behind which the nerve runs, which will certainly excite facial paralysis if it be not connected with more important changes, has by no means such a great importance.

The symptoms of this paralysis are well known to you. The first, you will often find, is, that the patient does not drink properly, and that, as in an awkward child, the fluid escapes at the angle of the mouth; and still more commonly that the patient remarks the accumulation of tears in the eye. This last-named symptom is almost always the first one complained of, and the imperfect carrying off of the tears, which, as is known, is accomplished by muscular action—a symptom which is present when the lids close perfectly, and when there is not the slightest turning outward of the lower lid, and consequent displacement of the lower canaliculus.

Paralysis of both sides seems to be quite seldom. I saw one case in connection with aural polypi on each side. The appearance here was very remarkable—not only that the face

remained always regular and cold in laughing or crying, the under lids with strongly-reddened edges were turned outward, and the corners were very prominent and dry from want of covering—but there was also a thick swollen under-lip hanging down, with the saliva dropping out of the mouth, so that the chin was obliged to be supported with a handkerchief; and if the patient wished to speak or eat, he was obliged to hold it up with his hand.

I have already called your attention to the fact, that an oblique position of the uvula and an abrupt bending of it to one side, while it is also somewhat drawn up, may be often observed without any paralysis of the face; and reversely, in well-defined facial paralysis, the uvula may not be affected at all.

You will often, especially in the French authors, for instance, *Rilliet* and *Barthez* on Diseases of Children, read of the tuberculous inflammation of the petrous portion of the temporal bone; and that is a common cause of otorrhœa, which leads to a fatal result under the name of pyæmia or meningitis. In the post-mortem examination, we find tuberculous deposits in the ear in great masses, and encysted tubercle in the mastoid process: "*Matière tuberculeuse infiltrée ou encystée.*" The whole inflammatory process, the ulceration of the membrana tympani, the otorrhœa, with all its results, was considered as coming from the softening of the tubercle, which was considered as the primary process. In a more exact examination, the most of these cases have another importance. There is certainly a tuberculosis of the bones, and we cannot deny the possibility of a tuberculous affection of the temporal bone; however, tuberculosis of the bones is a very rare affection. We must recollect that thickened pus and softened tubercle resemble each other very much. You know, gentlemen, that wherever pus is collected in any great mass, it becomes thickened and partially calcified, because the property of conglomeration of the substance does not allow of its complete breaking up and re-sorption. At the most, a part of the fatty covering disappears; the remaining calcified and thickened pus forms a cheesy mass, such as may be also developed from tubercle. These cheesy masses, of entirely different origin, are very often confounded, and to the unassisted vision they are scarcely distinguishable. Exactly here—in the cavities of the auditory ap-

paratus, in the cellular spaces of the mastoid process—are found large masses of pus, which gradually shrink up and form a cheesy-like substance; and perhaps the most of the cases designated in the literature as tubercle of the temporal bone are such deposits, which owe their origin to a long-continued purulent inflammation, and their undisturbed formation to a rare use of the syringe. However, even if such formations are not tuberculous, they have a very pernicious importance, as well for the neighboring parts as for the whole organism.

It is well known that these cheese-like masses also sometimes soften and produce an ulcerated condition, from which, according to Professor Buhl's observations, acute miliary tuberculosis of the lungs and other organs may be developed.*

There seems to be a similar condition of things, according to *Virchow's* examinations of the *cholesteatomata*, or the *mollusc-ous tumors* J. Müller, or *Mollusca Contagiosa* Toynbee, which occur in the petrous bone; for which names *Virchow* advises the substitution of the original name (*Perlgeschewülste*)—pearl tumors. These are the mother-of-pearl, shining, onion-like, layered tumors, in the posterior section of the temporal bone, which extend through the bone to the external auditory canal—sometimes, also, in the cranial cavity—as a rule, existing with chronic otorrhœa, which brings a fatal result. Examination proves that they are composed of flakes of epithelium, mingled in various proportions with cholestearine. It appears, also, that here we have to deal with inflammatory products, furnished for the greater part by the superficial surface of the auditory canal, which product is gradually accumulated, dries, and by means of continued peripheral growth, develops itself more and more into a solid body, which works as an offending substance, and by its pressure wears upon the adjoining parts, causing them to disappear. Since, then, in the temporal bone there is only a vacant space posteriorly, such a dried-up mass of secretion provides itself here with a closed space, until, if its growth be not disturbed, it reaches on, posteriorly, upon the petrous bone itself, upon the sinus transversus, or upwards against the brain, and thus produces a fatal result.

* Vide page 72, Tröltsch's *Anatomie des Ohres.* Würzburg, 1861.

Wherever fatty products are for a long time shut off from change of material, or metamorphosis, and become stagnant, we see, as is well known, cholestearine formed from it. The pus in the ear furnishes a considerable quantity of fat, as does also the secretion of the numerous sebaceous and ceruminous glands, and the experience of all pathological anatomists, from *Rokitansky* on, as well as that of aural surgeons, prove that in the external and middle ear extensive formations of cholestearine are something very common.

When we considered the diseases of the external auditory canal, we saw that the external surface of a mass of impacted cerumen often has a shining appearance, and consists of cholestearine crystals, which may be often found in cerumen. We often, also, may see cholestearine as a glistening point in the water, if we syringe out the ear suffering from otorrhœa.

I have sometimes found the deep parts of the auditory canal filled with flat, whitish bodies, which can only be removed in the course of several days with the help of a small spoon, and which were accretions of epidermis, with the well known rhomboid plates.

If these tubercle and cholesteatomata may be regarded in a common view, perhaps the difference of the formation may be derived from their respective points of origin, or the preponderating localization of the inflammatory process. If the increased secretion, for instance, takes place in the external ear, where, in a normal condition, the glandular and epidermis production is in excess, the circumstances will be more favorable for the development of cholesteatomata; and, to reverse the case, when the middle ear is principally affected, and pus is formed in excess of other material, the chalky-like matter will be more apt to be developed.

If we pass now from these last observations, which were by no means unnecessary parentheses, back to practical ones, we will see, from all points of view which we may take, how careful and hesitating we must be in our profession, in chronic otorrhœa, since we can never, with any certainty, say what great changes in structure have taken place. As *Wilde* very well says: "So long as we have a discharge from the ear, we are never able to say how, when, or where it may end." Several English Life Insurance Companies refuse entirely to take

risks on persons suffering from otorrhœa; and this rule seems to me entirely correct. Every discharge from the ear can, under certain circumstances, lead to an affection dangerous to life; and we are not always able to avoid such results. There are certain rare cases where patients with otorrhœa recover after long-continued typhoid symptoms—chills and metastatic abscesses—but these are exceptional. (*See Lancet, Feb.* 1, 1861.)

However, even in old cases of otorrhœa, we can often do a great deal of good, since we may labor against the extension of the affection, and sometimes we may even improve the hearing.

Treatment.—This consists, first of all, in removing the secretion by means of injecting fluids into the ear, and in reducing the chronic inflammation by the use of astringent drops; and, if the middle ear be principally affected, by normalizing the condition of the mucous membrane of the pharynx, to which we must pay due attention in all these cases. By means of this treatment, we may even heal declared cases of caries. In caries, *Rau* especially recommends the dropping in of the solution of the sulphate of copper: in the beginning, two to three grains; later on, from ten to twelve grains, to the ounce of water; this to be used twice a day. He speaks of it as the most reliable remedy, and only doing harm where it excites considerable irritation. A slight burning sensation, lasting only a few moments, is of no importance.

In these cases, we must always look out carefully as to the general conditiono f the patient. The local treatment, however, will be, generally, the most important part of the therapeutics, and in perfectly healthy individuals it will be generally enough.

If sub-acute symptoms appear, we must not omit to practise local blood-letting. I recall to mind a case in which, in the course of an otorrhœa which had existed for years, a suddenly-appearing facial paralysis as suddenly disappeared, after the use of Hourteloupe's artificial leech.

Since a discharge will never cease as long as polypi or dead pieces of bone are in the ear, we will often find an operation necessary for their removal. There are a number of interesting cases of the necrosis of great portions of the petrous bone. *Menière* saw a case (*Gazette Médicale de Paris*, 1857, *No.* 50) in which, after a long-existing otorrhœa, a piece of bone was.

removed in syringing, which, on more close examination, was found to be the whole of the cochlea, coming out with the pus without any cerebral symptoms. *Wilde* relates a case of a young lady, who, after the severest symptoms of otitis, with inflammation of the brain, paralysis of the face, one arm and leg, had removed from her ear a mass of bone, which consisted of the whole internal ear, the cochlea, the vestibule, and the semicircular canals. She recovered from the head symptoms, and from the paralysis of the limbs. Menière and myself have both observed cases of nearly complete necrosis of the labyrinth. (*Virchow's Archives*, *vol.* 18, *sec.* 9.) A young man who suffered for a long time from otorrhœa, with brain symptoms, was cured immediately after the removal of a thick piece of bone, three centimetres long and two thick, taken from the interior of the mastoid process. (*Union Medicale*, 1860, *No.* 52.)

(Dr. C. R. Agnew, surgeon to the New York Eye Infirmary, who founded the present Ear Clinic in that institution, communicated a case to number sixteen of the sixth volume of the *American Medical Times*, page 183, which possesses so much of interest on this subject, of which Dr. Tröltsch is now speaking, that I give it in full, with the illustration of the specimen, kindly furnished me by Dr. Agnew.

W. C., æt. 38, had suffered from otorrhœa from the right ear for the greater part of 32 years. The origin of the disease was obscure. Considerable sense of hearing remained till three years before the case came under my observation, at which time an exacerbation of the aural inflammation, accompanied by prolonged and excessive pain deep in the ear, and through the neighboring parts of the head, terminated in total loss of hearing in the affected organ, and paralysis of the corresponding portio dura of the seventh pair.

Several times during the progress of the disease granulations sprouting from the depths of the external ear, outcropped at the meatus, and were removed by torsion.

The patient came under my observation for the first time on the 16th April, 1862, presenting evidences of great suffering and debility.

He had suffered greatly for months from growing pain in the ear, insomnia, loss of appetite, and dizziness. An examination of the external ear was effected with great difficulty on account

of its excessive tenderness. The concha, swollen and inflamed, was elevated by a dense inflammatory tumefaction, circumscribing the external meatus, extending backwards over the mastoid process, and forwards along the zygoma. Projecting from the meatus was a large pear-shaped polypus of a dense fibrous character, bathed by a constant flow of stinking pus. Desiring to get to the bottom of the case, I placed the patient under chloroform, and removed the polypoid mass by means of a wire snare. In attempting to push the snare to the bottom of the meatus, I encountered a solid obstacle in the region of the middle ear, which subsequently proved to be the sequestrum, represented by the accompanying wood-cut. The calibre of the external meatus had been greatly reduced by boggy swelling of its soft parts, so that I was compelled to make as free an incision as possible to enable me to reach the sequestrum with a pair of small dressing forceps. Having got the body in the grasp of the forceps, a slight rocking motion with traction enabled me to extract it.

It will be observed that the sequestrum includes the wreck of the labyrinth. The cochlea is shown laid open by caries, and two of the semicircular canals are seen in part. The loss of hearing and paralysis of the seventh pair were explained. Two views in facsimile are given of the sequestrum in the wood-cut, and an attempt has been made by the artist to represent the eroded appearances.

The remains of the anterior semicircular canal are indicated by the letter C, the cochlea B opened by caries shows the lamina spiralis. The vestibule, E, A, D, is bereft of its furniture, and almost obliterated. After the operation, the patient rapidly regained his health, and by the 3d of January, 1863, the external meatus had become closed by cicatrization. The paralysis still remains.

In September, 1863, I was informed by Dr. Agnew that the patient was doing well, no head-symptoms, no otorrhœa, and a minute meatus externus is seen.)

When in the course of an otitis, with or without otorrhœa, the mastoid process begins to be painful, and tender on pressure, and the swelling and redness of its covering indicate an inflammation of the bone, lying under, a free incision of the soft parts down to the periosteum is often of great use. Wilde recommends this procedure as one by which a process dangerous to life may be restrained, and I have had opportunities to test the use of such incisions.

(In the New York Medical Press, vol. ii., p. 833, occur some clinical remarks of Prof. A. C. Post on this subject of post-aural inflammation, which show a full appreciation of the affection.

"Patient, æt. 30, came to the Professor's clinic on account of pain in his ear and about it.

"We have here, gentlemen, a swelling behind the ear involving the deeper tissues, called a post-aural inflammation. It is very dangerous in its character, if not properly attended to, being of the same general character as a paronychia. *If not relieved by incisions* it will involve the bone, causing necrosis, extend to the encephalon, and with great suffering cause the death of the patient. I once attended a young girl approaching maturity with præ-aural inflammation, an affection of the same character in front of the meatus auditorius externus. It went on to the destruction of the anterior margin of the external meatus, but the patient recovered with a loss of bone. A sister of this same patient was attacked with the same affection, and died from its extending to the encephalon. She was not under my care, but the case came to my knowledge.

"Incisions should be made fairly down to the bottom of the parts, so as to allow the matter free exit, and to relieve the tension. Such an incision was then made between the course of the occipital and posterior auricular branches of the external carotid. Pus was found next to the bone."

A similar case occurred to the editor while temporarily in charge of the ear clinic of Dr. J. H. Hinton, of this city. The incision made by me was followed by instant relief to a pain of an agonizing nature, and the case has progressed well. The comparison of the affection by Professor Post to Paronychia, conveys in a few words the whole idea of diagnosis and therapeutics, for this trouble.)

The incision must be long enough and made with a powerful hand, in order that the periosteum may be divided in its whole length. The swollen condition of the parts often renders the depth to which the knife may reach, very considerable. The incision should be made parallel with the line of the auricle, so that the posterior auricular artery may not be injured. The hæmorrhage may be considerable. If an artery spouts, it may be twisted ; even if there be no evacuation of pus, the discharge of blood will afford great relief, and better the condition very much. If the circumstances require delay, apply poultices. (I can imagine few circumstances admitting of delay.)

If the symptoms indicate the deeper situation of the diseases I would not hesitate to perforate the bone, and thus evacuate the pus by making an artificial fistula behind the ear. This perforation of the mastoid process, in case of purulent collections, has been performed only eight times, so far as I know, once by myself, and always with good results ; sometimes actually saving life.

If this operation stand somewhat in bad repute among surgeons, it is because in the last century it was recommended as a remedy in all kinds of deafness, while it is never indicated but under the above-named circumstances. How often good methods of cure are disregarded and forgotten, because of improper use? In most cases, the incision behind the ear will be sufficient, and if the necessity occurs, the perforation may be performed two or three days later.

In the only case in which I perforated the mastoid process, I did it with an ordinary blunt probe ; when the bone is thick, we can use a small trephine. In order to avoid injury to the dura mater and sinus transversus, we must place the instrument on the same line with the meatus, and work the instrument lightly forward in a horizontal direction. The greatest care must be exercised in the operation. When we have removed the pus in this way, we can remove the subsequent collections by squeezing, and keep the fistula open by a tent of lint.

You will still allow me a few words, gentlemen, concerning the prejudice felt even more by the profession than the laity,—a prejudice which certainly owes its origin to us,—against the

local treatment of otorrhœa, as having a bad effect upon the general health. I have always found the opposite to be true, —that with a gradual diminution of the aural discharge, the general condition is improved; and that very many persons lose their lives because the process is allowed to go on.

When, for the first time, I saw an otorrhœa, which had existed for years, disappear after the removal of a polypus, so to speak, in the twinkling of an eye, I took the precaution to order laxatives for a few days: or in other cases, the establishment of an issue on the arm. One patient, being tired of the uncleanliness, allowed it to heal; another did not follow my advice, and with no evil results. Since then, I allow over-anxious persons to drink "bitter wasser" for some days, in order to quiet their fears, because I have learned that such a sudden cessation of the discharge is *not* productive of evil results.

When there exists no polypus, foreign body, sequestrum, or the like, and the otorrhœa, with our best efforts, will not heal, we will be very likely to regard each view of the surgeon against the sudden stoppage of the discharge, as very like the idea of the fox in the fable, when the grapes were beyond his reach.

We can only heal a discharge from the ear with good results, when we know the cause of the malady; since this is often wanting, the treatment often fails to do the patient any good, and then the idea occurs to both the patient and the physician, if, on the whole, it were not better to leave the whole thing to good Dame Nature. Let it be added to this, that a sudden lessening of an otorrhœa appears at the same time with some general malady, and it is immediately concluded, that this sudden stoppage of the discharge is the cause of the disease. Effects and causes are here confounded; another reason must be sought for. The discharge ceased, because from some kind of an injury, possibly from the use of an unfitting, too strong ear-wash, an acute inflammation of the ear has set in.

There is less purulent discharge from the ear, because it has suddenly made a way inward, or because by some mechanical hindrances it has been shut up in the depth of the ear. These last reasons indicate a worse condition, and an affection of the brain.

But, for the justification of the general practitioner, it must,

finally, be remarked, that this belief, that local remedies can easily do harm in otorrhœa, is due to the teachings of aural surgeons themselves, to the writings of the otherwise worthy Frenchmen, *Du Verrey* (1863), and *Itard* (1838).

(Through the courtesy of Mr. T. Edwards Lewis, student of medicine, I am furnished with the note of a case, presented at Professor Post's clinic in the university, which illustrates in a striking way, the importance of a "discharge from the ear," which so many practitioners tell patients that their children will grow out of. A little inquiry among the surgeons of our city has surprised me, showing the extreme frequency of suppuration within the cranium, resulting from otorrhœa and caries of the temporal bone. Dr. Thaddeus M. Halsted, one of the surgeons to the New York Hospital and New York Eye Infirmary, says, he remembers eight cases of the kind Professor Post, in his ordinary clinical lectures on otorrhœa, alludes to a number of interesting ones, and thus one might go on citing these examples treating such a warning lesson.

A woman, 23 years of age, born in England, presented herself on the 10th October, 1863, complaining of intense pain in and about the right ear. She was in a weakened, anæmic condition, could scarcely stand alone, and was failing rapidly. There was a partial paralysis of the muscles, supplied by the portio dura of the seventh pair on the right side, and the Professor spoke of the connexion of the portio dura and mollis in the meatus auditorius internus, and that the nerves were probably destroyed by suppuration in this case. The third pair was intact, as shown by the ability to lift the lid, although not to close it perfectly, that action being effected by the orbicularis supplied by the portio dura.

"For a period extending from early childhood up till this time, the patient has had a discharge from the ear at varying intervals. Just now there is no discharge, but intense pain in the region of the ear, and general symptoms of cerebral congestion.

"Patient vomited in the cars on coming to the clinic. This otorrhœa has never received any continued rational treatment. This last attack was superinduced from cold from a draught of air, caught about a month since.

"An unfavorable prognosis was pronounced. The patient

was, however, seen and prescribed for daily by Mr. Lewis, under the direction of Professor Post. The cerebral symptoms increased, and on the night of the seventeenth, seven days after coming to the clinic, patient died, being for some time previous in a semi-comatose condition."

Here should follow the record of the section of the cadaver, but permission for a post-mortem examination was persistently refused by the friends of the patient.)

LECTURE XXII.

NERVOUS DEAFNESS.

Absence of Exact Anatomical and Clinical Proof of the Affection.—A Case of Nervous Deafness in an Artillerist.—Affection of the semi-circular Canals with Cerebral Symptoms according to Menière.

Gentlemen—An intelligent ophthalmologist once described Amaurosis, or nervous blindness, as that affection of the eye, in which neither patient nor physician is able to see.

Since the discovery of the ophthalmoscope this definition has lost its point, for with its aid we can recognize many different changes in structure in cases of amaurosis.

Yet, we may avail ourselves of this definition for nervous deafness. Since this is that disease of the ear, in which the patient does not hear, and the physician does not see why.

We must decide that a patient is affected with nervous deafness, when we can find no change in the material structure of the auditory apparatus, from which the diminution of the power of hearing can be deduced.

Of course, such a diagnosis requires a very exact knowledge of the parts, and a well founded capability of observing slight deviations from the normal; and nowhere is the degree of advancement of the physician, and the stage of development of science, better shown than in nervous diseases.

With every increase of our knowledge of the morbid processes, taking place this side of the labyrinth, and with every improvement of our method of examination, the field of nervous affections of the ear becomes smaller.

The diagnosis "nervous deafness" will be the oftener made, the less the surgeon is able to distinguish the different affections, the less he understands how to examine the affected por-

tions, and the less knowledge he has of the pathological changes of the external and internal ear.

Examinations of other fields of science, as well as the history of our art, teach us that in proportion to the improvement of the objective modes of examination of nervous complaints, and the progress of science, together with the influence of pathological anatomy, the diagnosis "*nervous*" becomes, to a certain degree, a chance hit, a declaration of not knowing and not finding, and is only a common one for those who use it willingly.

I will call only one department of disease to your recollection, in which we were formerly contented with the frequent diagnosis "nervous affection,"—affections of the female genital system. Now, these are found to depend very often on morbid material changes, and we are able to make a more favorable prognosis to affections of the parts, when properly treated, which were formerly regarded as incurable.

Then, gentlemen, let us confess, that we only name those affections "nervous," which we do not comprehend, and which, as a rule, we cannot improve.

William Kramer, one of the oldest and most distinguished aural surgeons of the present time, says, that while formerly he considered nervous affections to be the most common of all of the ear, almost exceeding fifty per cent. of all the cases, now, with the advance in pathological anatomy, especially in the study of exudations, he has reduced their frequency to a minimum—four in a thousand.*

Let us see, now, what we can say with reference to the anatomical and clinical facts in their relation to nervous deafness.

Its anatomical substratum must necessarily, before all things, be sought for in the labyrinth, in the auditory nerve and its source of origin, and finally in the brain; whose disturbances of circulation will always declare themselves on the inner ear, since the vessel carrying blood to the labyrinth is a cerebral artery, and the veins, venæ auditoriæ internæ, empty into the venous sinuses of the dura mater. Rudolph Wagner says: "One of the most humiliating tests of the incompleteness of

* See "Kramer's Aural Surgery of the Present Day." Ohrenheilkunde der Gegenwart. Berlin. 1861. Page 39.

our knowledge of the functions of the parts of the brain is this —that the central organ of hearing is entirely unknown, while we certainly know that for sight. I think it probable that it is to be sought for in the medulla oblongata spinalis." Zeitschrift für ration. Medezin. 1861. Book 10, page 277.

Very few morbid changes have as yet been observed in the labyrinth, which fact is due to the unexplored condition of this branch of science; and we are not certain if the processes which have taken place in the middle ear are primary, and those of the internal ear only secondary. And furthermore, its condition may depend on the greater or less quantities of otolithes, and the presence of the often-spoken-of black pigment, which, in almost every healthy ear, may be found in different parts of the covering of the labyrinth.*

Many appearances may depend on post-mortem appearances, which very quickly show themselves in these parts, and make the decision difficult.

Toynbee, who has made the greater number of sections of ears, gives, as among the appearances of the labyrinth, the following :—extravasations, exostoses, thickening and atrophy of the integuments, insufficiency of the semicircular canals, hypertrophy of the cochlearis muscle. However, his descriptions are extremely short and fragmentary, and he does not appear to attach much importance to "nervous deafness" in his text-book.

Voltolini speaks much more of the diseases of the internal ear. In almost every temporal bone of deaf persons which he examined, he found morbid changes in these parts, and therefore, he, like *Kramer*, except that his opinions are based on anatomical grounds, considered nervous deafness the most common of the diseases of the ear.†

He found thickening of the integuments, calcareous formations, and at one time a fibro-muscular tumor, absence and excess of otolithes, collections of pigment, amyloid degeneration of the auditory nerve, and once a sarcoma of the nerve.

Clinical facts are wanting for the confirmation of this dia-

* Vide Kölliker's Geweblehre. 1852. § 234, and § 235.

† Virchow's Archives, book 22, hp. 1–2.

gnosis, nervous deafness, and we must for the present adhere to those facts, which are in turn wanting in anatomical proof.

Thus it is often said by sick people, that after somewhat large doses of quinine they have suddenly been attacked by a violent singing in the ear, accompanied by considerable difficulty in hearing : a distress, which generally—although not always—entirely disappeared after a while. Generally these phenomena appear, accompanied by other narcotic or poisoning symptoms. They must, therefore, no doubt, be attributed to the effect of Quinine upon the brain, or upon the vascular system. In this connection also belongs that transient deafness, which *von Scanzoni* several times observed to appear over the whole body, after the application of leeches to the vagina, usually with a general vascular excitement, and with the eruption of *Urticaria.* Hysterical and chlorotic people often experience peculiar vacillations in the power of hearing, which together with the negative state in the ear are in such singular sympathy with the general health, and the sexual functions, that they can only be denominated "nervous" phenomena. As in fainting, a transient singing in the ear, together with difficulty of hearing, appears, so also is it the case with the longer enduring anæmia of the brain after large loss of blood. To this may be added, in part at least, that hardness of hearing, which is observable in people suffering from typhoid fever with negative, objective symptoms, a difficulty which generally disappears of itself in convalescence with the increase of the general health, or under an invigorating treatment.

As is well known, severe concussions, or a fall on the head, excite "nervous" deafness. Of the former class I am able to relate to you, among other instances, a very striking one from my own experience. In the summer of 1858 an artillerist, Martin Baumann from Ansbach, 21 years old, was brought to me by the military surgeons Drs. Rast and Hausner. He himself a strong, and as yet always healthy man, states that he received in his ninth year a blow on the ear from his father, in consequence of which he heard nothing in that ear for eight days. Whether he had any suffering with it, or on which ear he received the boxing, he cannot say. But he asserts quite confidently that he was able to hear perfectly well after that, until within two days. He states, that two days before, during

artillery drill, he was connected with the service of a six-pounder gun; and that he stood during the firing about two feet from the muzzle, his face fronting the gun. The first six shots, which followed each other at intervals of about ten minutes, called up a strong and unpleasant concussion. At the seventh shot he felt an extremely violent pain in both ears, as if a javelin was stuck through his head. From this moment he was deaf. This violent pain lasted about two hours. After that he experienced only a strong singing, together with a dead-feeling in his head. The patient, who spoke unnecessarily loud, understood only when spoken to slowly and distinctly through an ear-trumpet; and he did not hear a loud ticking clock, on the mastoid process, but only on the frontal bone; and then he stated that he did not *hear*, he only *felt* a gentle concussion.

In his organ of hearing, there seemed to be nothing out of order, omitting a slightly elongated red spot in the back half of the right membrana tympani behind the middle of the hammer. This spot, which was a slight linear slit, or small extravasation, rapidly grew paler, and continually smaller, and after two weeks it was scarcely discernible. Air blown in by a catheter entered easily and clearly from both sides, without any further phenomenon: except a dull feeling in the head, the sick man was perfectly well. He had appetite, and all his functions were normal. His treatment in the military hospital consisted at first of calomel and jalap in aperient doses, simultanously with cuppings on the neck:—afterwards a rubbing of *tartarized antimony* salve behind the ears. The condition remained steadily the same, except that the patient gradually screamed less boisterously. Twelve days after the accident I commenced a treatment by faradization of the ears, first with a quite weak and brief current, slowly increasing the strength of the current, and the duration of the treatment. The negative pole was held in the entrance to the ear, which was filled with water,—the positive pole rested on the moistened *mastoid process*, and afterwards on the neck also. After the treatment the buzzing was a little stronger for a time. A violent pain in the ear accompanied stronger currents, and also some injection on the malleus. This electric treatment was continued daily for six weeks with slight interruptions without any change of the condition. The patient felt as well before as after, except

the continued deadness in the head. Simulation, which must be guarded against among soldiers, was not to be thought of judging from his whole conduct. Moreover, during the whole time of his treatment he was continually watched in the military hospital: and also after he had been dismissed as a soldier to his home, where he followed his trade as a glove-maker. Report was made at the year's end, that his deafness continued unchanged, although it became soon less apparent as the very intelligent patient quickly accustomed himself to observing the motions of the mouths of speakers.

I believe, it can scarcely be explained differently than that this violent explosive concussion, in this perhaps peculiarly predisposed person, had brought about a paralysis of the acoustic expansion, either directly (as sometimes the destruction of the optic functions is reported by a sudden dazzling), or indirectly in consequence of hæmorrhage in the labyrinth.

If deafness occur after a fall on the head, it may often connect itself with changes in the brain, or with a fracture of the base of the skull, which, as you know, winds its way frequently through the temporal bone. For instance, there lives here a whitewasher, an extremely jovial fellow, who many years ago fell from a church-steeple, which he had to whitewash. He lay for a time in the Julius Hospital, in consequence of a fracture of the skull: and, since this accident, is so stone-deaf that he assured me, that for the sake of trial, he had placed himself near a cannon being discharged, and that he had certainly *felt* a concussion in his head and feet, but that he had *heard* nothing of the report. Such cases of absolute want of appreciation of sound are extremely rare; for even deaf and dumb people frequently react under a strong noise; for instance, the report of a percussion-cap, or the ringing of a bell near their head.

One of the most worthy contributions to the science of nervous deafness we owe to late French investigators, especially to Dr. P. Menière of Paris Deaf and Dumb Institute, who unhappily died at the beginning of this year, and who was altogether one of the most meritorious workers in the province of aural surgery. Menière, in the year 1861, drew attention to a series of most remarkable diseases, which appeared under the form of an apoplectic congestion of the brain, with sudden vertigo,

vomiting, great singing in the ears and a fainting condition, and which frequently left behind a certain impediment in motion, a continuing unsteadiness in standing and walking, and thus gave the surgeon from the beginning an impression of a congestive affection of the brain; while through the constant recurrence of all these disturbances, and through the remaining of a generally very remarkable difficulty in hearing for which no assignable change in the ear could be found, they decidedly proved themselves to be indicative of an affection of the inner part of the ear. The affection of the hearing proved itself to Menière, despite all local and general methods of treatment, to be incurable; while the universal disturbances, which appeared so threatening, disappeared gradually, and the patients afterwards enjoyed complete health. Menière, as a warrant for the presentation of this new form of disease, communicates a considerable series of histories of patients, abridges his experiences on this point in the following propositions:

1. A hitherto entirely sound organ of hearing may suddenly become the seat of functional disturbance, which consists in a humming in the ears of very varied nature, now continuous, again intermittent, to which a decline of various degrees in facility of hearing soon joins itself. 2. These functional disturbances have their seat in the inner part of the auricular apparatus, and have the power of calling up apparent brain fits, as vertigo, stupefaction, unsteady motion, whirling motion, and sudden concussion, beyond which they are accompanied by inclination to vomit, actual vomiting, and by a sort of fainting condition. 3. These fits, which occur after free intermissions, are always followed by a greater or less degree of difficulty of hearing, and more frequently the power of hearing becomes suddenly completely annihilated. 4. It is most probable that the material change which lies at the foundation of these disturbances has its seat in the semicircular canals.

This view of the conjectural seat of the disease in the semicircular canals, Menière supported partly by a similar case, on which a post-mortem was had, partly by certain physiological experiments. Concerning the first, the case is of a young girl, who in a nocturnal journey on the imperial of a diligence during her menstrual period, caught a severe cold, became suddenly completely deaf, experienced thereby a continuous vertigo, at

each attempt to move vomited, and on the fifth day died of the disease. The brain and spinal cord were entirely sound, and the ear showed no pathological change whatever, except in the semicircular canals, which were filled with a red, plastic lymph, a sort of bloody exudation, of which scarcely any traces showed themselves in the vestibule, and none in the cochlea. The physiological experiments, which must be here mentioned, are those of *Flourens*, who, as is known, after the injury of the semicircular canal, in doves and rabbits, noticed different kinds of dizzy motions, unsteadiness in moving and resting with evident loss of equilibrium, and more frequent tumbling over. An observation of *Signol* and *Vulpian*, recently laid before the society of biology, is of great importance to this topic. It is of a rooster, who in a combat with his equal, presented precisely the same disturbance of equilibrium, and other manifestations in movement and rest, as Flourens noticed after the injury of the semicircular canal, and the like, and as Menière reported in the former cases. At the post-mortem section every abnormity of the brain and its integument was wanting; on the contrary, there was a partial necrosis of the bones of the temples, by which a greater part of the inner and middle ear of one side, as also the semicircular canals, were for the most part destroyed. This instance seems, indeed, to a certain degree to speak for the correctness of *Flourens's* discovery, and serves at all events as authority for the assertion that diseases of the inner part of the ear are calculated to call forth identically the same results as the direct experimental injuries of this organ.

These communications are extremely worthy of notice, and incite us to exact observations and experiments in this direction. The subject, nevertheless, may in no manner be considered as concluded, as manifold demonstrative dissections and various corroborations of the facts of observation are necessary to it. I myself remember, in my somewhat extensive practice, only a single case which was analogous to that of Menière, although here also certain symptoms were not to be rejected, which implied a catarrhal process in the tympanum.

In addition, we must remember that in the symptoms above introduced, one at least, vertigo, is called up by various processes of diseases of the ear: especially by the stoppage of the meatus by ear-wax or other material, by acute catarrh and

purulent processes in the cavity of the tympanum. We have seen that, if these conditions cause vertigo, we must consider this preëminently as a symptom of abnormal pressure, which is made upon the drum, and therewith upon the chain of little bones, or upon the last articulation of the latter, the stapes, and its fenestra. The increase of the pressure, which was produced in a peripheral manner, and which was transferred from the stapes to the vestibulum, must necessarily place the semi-circular canals in an abnormal state of pathological irritation, and this condition might be designated as the same with all these different forms of disease of the ear (which are followed by vertigo): and perhaps it is of importance only for the extent of the appearances and their further results, whether the irritation is one transferred from the periphery or arising mainly in this division of the labyrinth itself. In any event we must, for the present, be on our guard not to infer from similar instances that there is a primary affection of the semi-circular canals or of the nervous apparatus. We must be doubly careful in the supposition of a nervous cause for affections of the ear, because catarrhal processes of the tympanum, pressing upon the wall of the labyrinth and the two fenestræ, often localize themselves, and a high degree of deafness appears under manifest symptoms of irritation of the inner part of the ear; while one of the chief points of the diagnosis, the changes on the tympanum, are little manifested, and the remaining inferences which result from the condition of the mucous membrane of the throat, and the use of the catheter, frequently exist only in the beginning of the affection. That diseases of the middle ear often assert themselves in a secondary manner on the labyrinth we noticed before, where we found in every case of catarrh of the Eustachian tube, in consequence of one-sided atmospheric pressure, which weighed upon the tympanum, that the stapes is pushed further inwards, and thus the fluid of the labyrinth is exposed to an increased pressure, which condition, if somewhat longer continued, will leave behind it lasting disturbances of the nutritive supply of the ear.

The degree of functional disturbances cannot be determined, in the Ear, as in the Eye, where even when the media are obscured, we can make an exact conclusion as to the condition

of optic nerve and retina. The physiology of the faculty of hearing has, unhappily, thus far, not taught us what degree of deafness can arise from simple peripheric causes, and from what point we must suppose an affection of the nervous apparatus. Even if we can connect certain higher grades of deafness, from universal hypothetical grounds, with a lack of perceptive organs, still every intimation of a settled boundary line is wanting, before which peripherical interference with the conducting of sound is possible, and behind which only dulness of the brain or the acoustic nerve and its ramifications is imaginable. It is certain, and established experience proves, that primary processes in the cavities of the tympanum presuppose a high degree of deafness, perhaps with an inclusion of the influence which they exercise through the fenestra in a mechanical way upon the contents of the inner part of the ear. Let us consider, by way of illustration, a case where the stapes is immovable and surrounded by masses of bone; consequently, the fenestra ovalis is quite shut; furthermore, the membrana tympani secunda is converted into a thick, inelastic or chalky plate, and the entire canal of the fenestra is filled with a compact plug of connective tissue; nevertheless, the labyrinth may still be sound, but the acoustic fibres can be reached only by those vibrations which are transmitted to them through the denser parts, viz. the skull bones.

Up to this time pathological anatomy, clinical experience, the consideration of the nutritive position of the labyrinth, and finally, the reflection that in other organs, especially in the eyes, disturbances of the nervous apparatus are proportionately infrequent—have all taught us that the seat of disease in the ear is far less frequently to be sought in the labyrinth than in the structures which transmit sound. However, this view avails only *salva meliori*, as the lawyers say, *i.e.* so long as we know nothing better, and so long especially as manifold pathologico-anatomical observations, susceptible of proof, do not demonstrate a greater abundance of changes in the inner part of the ear as a reason of the disturbance of the mind.

If there are in addition to the abnormities of the inner ear any changes whatever existing, for instance, in the cavity of the tympanum and the drum, the diagnosis will be still more diffi-

cult, for we possess no mark which points certainly and exclusively to an integrity or affection of the nervous apparatus. We shall, in the next chapter, speak of the circumstances attendant on the hearing of a watch, through the bone of the skull, the so-called "knöckenleitung" conducting power of the bones, the obstructing of which has been denominated a pathognomonic sign of the disease of the labyrinth.

Where a doubt exists whether we have to do with a catarrhal or a nervous difficulty in hearing, whether with disease of the middle or the inner part of the ear, you will do well, in my opinion, in every relation, scientific as well as humane, to consider the first form the more probable one, especially since in this event a proper treatment, in most instances at least, is able to stop the progress of this evil, while real appearances in the inner part of the ear, if not dependent upon anomalies of blood and circulation, are, as a matter of course, almost entirely removed from our therapeutic interference, and we shall be obliged to "let things go as it pleases God."

I did not mention above the diseases of the labyrinth, which were presented by *Erhard*, for I am sure that if you take up the "*Rationelle Otiatrik*," after an examination of a few pages, you will be convinced that this book makes similar pretensions to objectiveness of statement and sobriety of observation with *Münchhausen's* descriptions of his hunting tour; and you will find as regards the correct working up of material, the arrangement or the consequent direction of the thoughts, that it is almost unique of its kind in the medical literature of this century. You will be astonished if I tell you that this book has been imposed upon sober men as true science, and in respectable Journals criticized in a manner most worthy of acknowledgment; this is comprehensible only from the truly childish ingenuousness of so many physicians who have been the readers of this book, and the critics who have reviewed it.

LECTURE XXIII.

Otalgia.—Deaf-Mutism.—The Application of Electricity in the Treatment of the Ear.—Hearing Contrivances.

Gentlemen—As we have recently considered nervous deafness and its manifestation, we have still to mention, in a few words, nervous ear-ache, or otalgia.

Nervous ear-ache, which does not depend upon inflammatory action, Otalgia nervosa, is, at all events, a very uncommon disease, and appears infinitely less frequently than is generally supposed in the ordinary practice, in consequence of a generally imperfect examination of the ear. There is, nevertheless, a pure neuralgic form of ear-ache, and it is, in its severity, an extraordinarily painful disease. It most generally occurs with the decay of a molar tooth on the same side, or proceeds from the same. In one case of that kind, which I knew, the pain in the ear disappeared immediately after the extraction of the tooth; in another, after a suitable filling of the decayed cavity.

In this place, it is proper to speak concerning the deaf and dumb condition, so far as it may here interest us.

A child who is born deaf, or who becomes quite hard of hearing in the early years of life, does not learn to speak at all. Children who already speak, lose again this faculty, if they become deaf in early age, say somewhere up to the seventh year. While one ordinarily speaks only of a congenital and acquired deaf-muteness, it seems to me more conformable to facts, and important in practical relations, to distinguish three origins:—a congenital deaf-muteness, where the child never heard and never spoke; another which develops itself in a child who, answerably to his age, decidedly hears, but who cannot speak (an early acquired deaf-muteness); and a third, among children who have already spoken a shorter or longer

time, and then have lost hearing and speech also (a late acquired deaf-muteness). In a single case, it is often difficult to decide whether it belongs to the first or second form, for the information of relations, that the child has heard for awhile, rests frequently upon very little careful observation, and many parents are unwilling to have it said, that a child is deaf and dumb from birth.

The pathological anatomical condition among deaf-mutes does not distinguish itself very essentially from that which we meet in individuals who are simply hard of hearing, deaf. We find that there appear here almost as frequently developed morbid processes in the cavities of the tympanum, as well as abnormities in the deep parts and in the labyrinth, in the acoustic nerve, or in the brain, especially in the region of the origin of the acoustic nerves in the fourth ventricle. Among the conditions in the labyrinth, mention has been made startlingly frequently of a partial and entire lack of semicircular canals. Not at all infrequently, the examination of the inner region of the ear gives an entirely negative result, so that the clear evidences of catarrhal irritation in the cavities of the tympanum must be looked upon as the essential condition; and it appears to me certainly very probable that peripheric changes in the organ of hearing alone can bring about deaf-muteness. We leave out of view here, those cases of congenital imbecility, deformity of the brain and cretinism, where the deaf-muteness is only a partial evidence of an original, anomalous organism.

We take a well established case. In consequence of an acute or chronic aural catarrh thickening of the round fenestra occurs, accompanied by anchylosis of the stapes. These material changes will be accompanied by a difficulty of hearing to a high degree, possibly so that a grown person will only understand when one speaks loud and long in the neighborhood of the ear; this is, in the case of an adult who has formerly heard, and who always before has been accustomed to understand language, and could make it known if one did not speak sufficiently distinctly and near. How, now, is the same degree of hardness of hearing to manifest itself in a little child who has not yet learned to hear and to be attentive to what is to be heard, and to whom the words of the mother are the same originally that a foreign, unknown language is to us, of which we

know not the significance and the expression of the words? Such a child, who only perceives distinctly, that which those around him speak, under especially favorable circumstances, —therefore, only at times,—to whom, therefore, the opportunity is wanting in great part, if not entirely, of gradually and by himself learning the meaning of the words, will soon take no interest in what is spoken, will cling preëminently to the meaning of signs and gestures, and will still less himself make effort to speak, that is to reproduce, and imitate speech, because the language of others, which alone gives inducement to speak, does not properly exist for such a child. In this way, hearing is less and less practised and learned. The child gives more and more the impression of a completely deaf being, with whom to speak would be folly. The motive to speak is also wanting, and thus the child, who was, properly speaking, only hard of hearing, grows more and more deaf and dumb. But the same child, had he been spoken to, as in the grown person, slowly and distinctly and near his ear, and if the objects designated by language had been brought before his eye, would have learned gradually to hear, as also to understand what that which he heard meant; would have taken an interest in language and in trying to imitate what he heard, that is to speak himself: by such a treatment, he would simply have remained hard of hearing, and would have been able to express himself tolerably well. So, again, if a child, who already speaks, becomes hard of hearing to a high degree at an early age. Just so in the case of a grown person, a difficulty in hearing his own voice exercises a bad influence on his modulation and the regulation of expression. On the contrary, a child who is not a ready speaker because of a difficulty of hearing those around him and his own voice, generally loses the capacity of distinct utterance, and gradually the power of language itself, unless he is compelled, with pedantic severity, to the constant exercise of what remains of his faculty of hearing, and, in the case of necessity, the additional help of an ear-trumpet be employed, and at the same time, a methodical instruction introduced in distinct speaking and loud reading. You will now understand how we are able by means of great personal attention and methodical instruction in speaking and vocalizing to *cure* certain forms of deaf-muteness, or more

correctly speaking, to prevent high degrees of hard hearing from developing into deaf-muteness. It is very similar with those methods of education which are now carried on in the most approved institutions for deaf-mutes, only that at a later period the vocal organs have lost, to a great extent, their capacity for modulation, and a characteristic animal howling appears. An entire and long-continuing deaf-muteness, to be sure, is considered by all men of good judgment as incurable; and the much boasted cures of old deaf-mutes seem to be founded in illusion, or in ignorance of the fact, that from the outset, a large portion of the deaf-mutes are not absolutely deaf, but are still in possession of a certain remnant of the faculty of hearing, on the amount of which the capability of further development depends.

As a matter of course, medical treatment must be introduced as soon as possible, together with systematic instruction; and I could relate to you, from my practice, several cases in which deaf-muteness was obviously prevented, or when in a condition of development it was checked, or caused to retrograde. For instance, there is under my treatment at present, a child four and a half years old, who, from the first months of his existence, has suffered from a discharge from both ears, and is conscious only of loud sounds. Until within a few months, when I saw him for the first time, he was able to produce only quite inarticulate barking, and other sounds which were unintelligible even to the mother, so that he was already properly considered a deaf-mute child. Under a local treatment of the profuse discharge from the ear, this deaf-muteness soon decreased, and with the decrease of the discharge, the child manifestly commenced to notice noises which were made around him, and especially the words of bystanders; as also to make attempts to imitate what was said. These attempts were as far as possible encouraged, and the child was as much as possible employed in speaking words and sentences. In this manner I succeeded not only in decreasing the degree of hardness of hearing, but after a few months the child possessed a tolerably distinct, and at any rate quite intelligible language. With it, at the same time, the whole bearing of the child, who had been obstinate and unmanageable before, was changed: he became more docile, and lost something of his truly animal

liveliness, which manifested itself in the expression of the face, and in the continuous squirrel-like mobility of his whole body. Without these local applications and the correct guiding care of those about him, the child would certainly soon have been counted among the deaf and dumb.

You are now able to truly estimate why such great importance is to be attached to ear diseases in the first periods of human existence, and why, in the former Lectures, I urged on your consideration so earnestly, a careful investigation and observation of them in the case of little children ; and why, in consideration of its possibly great importance, I brought to your cognizance facts and minute details which have existed heretofore only anatomically, and for which the clinical estimate and decision are yet to come.

The same affection of the ear which makes an adult only hard of hearing, is able to deprive the child at the same time of language, and causes him, during his whole future life, to remain in a lower state of social and mental development. We must not, therefore, omit, or consider trifling, what can in the least give an explanation of the appearance and origin of ear-diseases in children.

I do not wish to say, of course, by the foregoing, that acquired deaf-muteness is always to be referred to the consequences of a high degree of hardness of hearing, and that the latter can always be checked or prevented by an early local and linguistic treatment. This may not infrequently be the case, but we must not forget that in the period of infancy as well as in old age there is a great tendency to affections of the brain, and especially to diseases of the cavities of the cerebrum and its integuments. It might be possible, also, that as *Voltolini* supposes in the case of children, there is a certain disposition to frequent and severe diseases of the labyrinth, and therefore, in childhood, a great degree of complete deafness develops itself proportionably more frequently than in cases of adults.

Electricity in deaf-muteness in its various kinds and modes of application, was strongly recommended during the past century up to the present time, for nervous, and in fact all kinds of deafness. If we must be somewhat distrustful of a too general acceptance of a remedy, and be careful whether in these favor-

able observations which have been communicated, the exact diagnosis of a competent person, or at least a somewhat thorough examination of the suffering parts has preceded the treatment, in this case, at least, we are compelled to a doubly careful application of this distrust, since there is generally connected some other application with the application of electricity, which, of itself, might have been able to have an improving effect on many forms of deafness. I mean by this the frequent filling of the meatus with lukewarm water. Accumulations of ear-wax, of epidermis and dry secretions, are not rarely at the foundation of this hardness of hearing, as we have already seen. They will be found, therefore, among the great masses of patients who have their ears electrically treated, and who are not examined at length beforehand. Once, a person who had been cured by electricity, told me quite honestly, that he had been surprised at the great quantity of ear-wax which, after a few sittings, every time after the electrical treatment, had secreted itself, so that his handkerchief, with which he cleaned the ear, was covered with great brown spots. Aside from such cases, and also aside from cases of catarrh of the Eustachian tube, or of the cavities of the tympanum, which not seldom underlie great vacillations, in hearing, there are, at the same time, it is true, many improvements by electricity related, and from decidedly creditable persons, in cases of hardness of hearing which had lasted for years, and had been treated and investigated sometimes by very distinguished aurists. This remedy must, therefore, be by no means treated contemptuously, as many aurists treat it; but we must endeavor, by means of these experiments, to get an exact knowledge of its manner of application and usefulness in many cases. The therapeutics of aural diseases leaves much to be desired, and we must always endeavor to increase the number of our remedies in all possible directions. A rash denial and rejection without thorough test is, therefore, certainly, in this case, least appropriate. I, myself, have often made use of electricity with persons hard of hearing, *i. e.* with inductive and faradaic electricity; yet almost never alone, but generally after a long-continued introduction of vapors into the cavity of the tympanum.

Most patients said they could hear better after a frequent

application of electricity. In the case of others, improvement of the hearing was striking, and could be proved as well by speech as by the watch.

But, in the use of my observations, I act upon the strongest possible self-criticism; for very frequently, distrust and control must be exercised over these ear-cases; since, it is proved, that the favorable influence of the vapors appears more after, than during the treatment, and I take for the present such assertions and observations of the patients with great care, and I do not yet attempt to prescribe in any detailed manner the use of electricity for the science of aural surgery. One thing, however, seems to me to be quite certain, since the same manifestation was too frequently repeated to be merely accidental, and this is, that often in the case of those patients whose ears had been faradized for any length of time, the frequency of the vacillations, to which their acuteness of hearing had been subjected, was decreased, and the deafness and fatigue occasioned by straining to hear, was very much lessened, these phenomena having appeared before, sometimes with and sometimes without weariness, or a desire for food.

In faradizing the ear, one conductor, a metallic bar, insulated down to its point, is dipped into the meatus which is filled with warm water, while the other, in the form of a copper wire which is covered, and bare at the points, is introduced through the catheter some distance into the tube. If we ask now, which parts the electric stream will preëminently influence in this manner, it can scarcely be doubted that the tympanum, and above all the middle part of the ear, and in the latter, the interior muscles of the ear, viz. the tensor tympani and the stapedius, as also the muscles of the Eustachian canal, are especially under its influence. If we were able to perceive the pathological conditions and functional anomalies of these muscles in the living body, it is highly probable that the indications of the applications of electricity in ear diseases could be formed more definitely. That muscular diseases appear also in the ear, is not only to be supposed *à priori*, but we have an anatomical proof of it in the case of the muscles of the cavities of the tympanum, since I found them in my dissections of the ear frequently diseased, in a cartilaginous, fatty, and granulous manner. What place must be assigned to the

inner muscles of the ear for the physiological and pathological state of the sense of hearing, has by no means been exactly and definitely determined. At any rate, it will be no insignificant and unimportant one. Heretofore, they have been considered a kind of accommodating apparatus, and in this regard I would like to remind you, that a series of morbid phenomena in the eye which, heretofore, have been considered nervous and indefinable, now appear as lesions of accommodation, *i. e.* anomalies of the accommodating muscles. It is conceivable that a similar condition may be the case in the ear, and especially the above-cited investigations concerning the influence of electricity may be explained in this manner.

Duchesne and *Erdmann* speak, in the application of electricity to the ear, of a "faradizing of the chorda tympani," against which it may be said that this nerve, of all others which here come under consideration, seems to have, at any rate, the very smallest importance to the ear and its functions.

This is the place to speak of those mechanical appliances or contrivances for improving the condition of those who are extremely deaf; making the human voice and musical sounds more distinguishable.

It has, hitherto, been a misfortune, that speculative mechanics have paid more attention to this subject than physiologically educated men. The result is, that the acoustics of the time has furnished fewer assistances to hearing than optics has for seeing. In other words, gentlemen, we have yet to discover spectacles for the ear.

You would be surprised, however, at the number and variety of the ear trumpets, which may be found in the possession of the poor patients who are hard of hearing. That which I have found to be the most useful for the greatest number of cases, consists of a stranded leather tube, of a foot or more in length, with horn extremities. The end inserted in the ear should be about the size of the meatus, the patient holding it in or on this part. Under certain circumstances, it will remain there of itself, especially if it be somewhat angularly constructed. The funnel-shaped end, to be held near the mouth of the speaker, must be small, if it be only for conversation between two; if it be used for more persons, or for a considerable distance, it should be larger.

In listening to lectures or sermons, this end should be laid on the table before the speaker. Such an ear-trumpet can be worn under the collar, in the case of men. Similar to this leather ear-trumpet, is one of pasteboard, which, for the sake of convenience, is made in sections, to be joined together when used. Some patients, however, are happy and contented with a cow's horn, simply adapted to the purpose. Apparatus of gutta percha generally deaden the tone too much. Those of metal are not long borne on account of their very strong resonance; and so with all instruments which must be constantly worn in the ear, they causing too much irritation and exciting noises in the ear.

The most of patients have the weakness to wish to conceal their infirmity, therefore they prefer such instruments as the small ones, which can be placed behind the ear, and under the hair. It is unfortunate that their value is quite as invisible as the instruments themselves.

The "Otaphone," from Webster, in London, has the advantage of being unseen; and is, also, of some considerable service. It consists essentially of a silver clamp fitted to the posterior border of the auricle, which has for its object to cause the ear to stand farther out from the head, and thus to make easier the reception of sounds. For many have noticed very often, that many patients have a habit, when they wish to hear anything a little more distinctly, of laying the hands or fingers behind the ear, and of thus bending it forwards.

It is astonishing what an influence this little manipulation has upon the hearing in some cases, and in these we may advise the use of the instrument. The auricle is particularly pressed down upon the head in the case of females, in consequence of the dressing of the hair, and the hat lying down upon it; and its elevations and depressions are hardly to be distinguished; for such cases, the otaphone seems to be peculiarly adapted.

LECTURE XXIV.

METHOD OF EXAMINING THE AMOUNT OF HEARING.

Hearing a Watch and Understanding Conversation, as compared with each other.— Watching the mouth of the speaker, by a deaf person.—How a measure of the hearing power should be made.—Conduction of Sound through the bones.—Better hearing in the midst of noise.—Acuteness of hearing.

GENTLEMEN—Now that we have considered all the affections to which the human ear is known to be liable, we have still to notice certain subjective symptoms, or functional disturbances of the sense of hearing; and finally, we shall have some remarks to make as to the proper method of examining patients.

When we are dealing with that most common result of an affection of the ear, deafness, in order to ascertain its degree, we must carefully regard two things, which do not always stand in exact proportion to each other. First: How far the patient can hear ordinary conversation. Second: How far he can hear the sound of certain tone-giving instruments.

We generally use a watch for the examination of the hearing distance, seeing whether the patient can hear the ticking at any distance from the ear; or only when pressed close upon the auricle or bone. In the former case, the watch should be constantly held in the same direction from the ear, for instance, parallel with the auricle; and instead of gradually removing the watch from the ear, let it gradually approach to it. Thus you will best guard yourself against self-deception on the part of the patient. Thus you will learn at what distance the patient begins first to appreciate the tick of the watch, and the one where he can distinctly count the ticks. Some aural surgeons hold a measure of leather between the ear and watch during this examination, consequently a conduction of the

sound occurs by means of this fixed body, and the result is quite different from that when the air is the only conductor.

We should previously have made an examination in healthy persons with the same watch we are using with the deaf, in order to determine correctly, what is the normal distance in which it can be heard. A watch with a clear tone, should be chosen, if possible. It often happens, that very intelligent persons are not able to distinguish between the ticking of the watch and the noises which they have in the ear—tinnitus aurium. In such cases, we would cause the patient to close the eyes during the examination. For certain cases, it is well to remember, that some watches, immediately after winding, have a somewhat stronger tone, and a softer one when they have been cleaned by the watch-maker. Some watches have no tone at all, and are scarcely adapted to our purpose. For certain grades of deafness, we can only use repeating or striking watches, and these have the advantage that you can approach them to the ear, at one moment striking, at another not doing so ; and thus can be certain as to the exact truth of the patient's statement.

However, setting aside all these possible ways of false conclusions, the watch alone does not afford a sufficient means of conclusion as to the amount of hearing of the person examined, because the distance to which the watch can be heard, does not always stand in proper proportion to the understanding conversation. You will quite often find a case, where the patient is able to hear conversation of a low tone, quite a considerable distance, and yet can hear the watch only when pressed on the ear ; and then, again, you will find the state of things reversed, that the understanding conversation is very difficult, while the watch can be heard when it is held some distance from the ear. Such a misproportion, we find, takes place sometimes when all the other circumstances which may render a correct judgment difficult, such as a peculiar mode of speech and foreign dialect, want of intelligence, are entirely wanting. As a general thing, persons who have become hard of hearing in childhood, hear the watch better than conversation ; and vice versa, those whose deafness has begun later in life, are less prevented from hearing con-

versation than the watch. However, exceptions occur to this, and perhaps we may believe that this proportion depends somewhat on the amount of practice in hearing a particular voice; and in adults, this is naturally greater than in children. Yet, in some cases, we cannot thus explain this state of things, and you will often find that a patient hears his own voice and that of the surgeon, immediately after the introduction of the catheter, much more distinctly, while he cannot hear the watch any further, and possibly less. As strange as this may seem, I have observed it to be true in many cases, occurring in undoubtedly trustworthy patients, and by various experiments I have satisfied myself of the truth of their statements. Those cases which especially verify these, are those of young persons between the ages of seventeen and twenty; and in cases of declared adhesive processes on the membrana tympani. You will find cases, also, where patients are deaf on both sides, and on one side hear the watch better, the other, the voice.

You see, then, gentlemen, what a one-sided decision you will give as to the hearing of your patient, and as to the benefit of treatment, when you rely upon the watch alone for tests of hearing. You must then make a closer examination, by testing the hearing of the voice and conversation; while one ear is being examined as to this, the other should be closed by the finger of the patient, and you should speak slowly, and distinctly, for instance, count, towards the side of the patient, varying from a loud to a soft tone, in different distances, or if necessary, by means of a speaking-trumpet, and cause the patient to repeat after you, word for word, what is said. You must guard against any deception, by seeing that the patient does not practise the habit of watching the mouth of the speaker. Almost all patients who are hard of hearing, very soon accustom themselves to watching the mouth of the speaker, looking always directly at it, in order to improve their understanding of what is said by seeing the motion of the lips. Most patients acquire the habit unconsciously, and without knowing the reason why, attempt to get opposite the speaker.

Thus, you will hear as a peculiarity and a proof of nervous deafness, that the patients hear much worse by twilight and at night in bed, than when it is light about them, when it is

only a natural result from not having the benefit of seeing, to aid their hearing.

Ladies, especially, accustom themselves to this habit of watching the mouth, and added to it, are such adepts in guessing, that although entirely deaf, they can hold a conversation for hours with their neighbor in society, without being disturbed from not hearing. Proper names and bearded men are an abomination to these ladies, for it is through them that their carefully concealed infirmity comes to light.

If then, hearing the tick-tack of a watch, and understanding conversation, in many deaf persons, stand in such an open misproportion to each other, it has various reasons which, perhaps, for the greater part, rest on the varied acoustic principles of these processes.

This is not the place to go very extensively into the subject; I will only further remark, that there is a great difference between *hearing* conversation and *understanding* it. A great many patients will tell you, that they are aware of the carrying on of a conversation, at a considerable distance from them, but it is a much less distance at which they are able to tell what is said.

Moreover, the tick-tack of a watch has only one tone, or at the most two tones of a certain depth, which often seems to occur exactly in the case of deaf persons, that some tones, or some classes of tone, which correspond to a certain tone height, are entirely out of reach of the hearing, or can only be appreciated in a considerable increase in the strength of the vibration. Thus, there are patients who hear deep tones proportionably better than high ones. Generally, however, the reverse is true, and tones which correspond to an excessive number of vibrations, in a given tone, as for example, the voices of females and children, are proportionately better heard, even when the tones are not very strong. This is, however, generally the rule. Deep tones must be proportionately stronger in order to be heard equally well with high ones; and as is well known, the voice of a basso must have a greater intensity, be stronger than that of the tenor, if he wishes to fill the opera-house as well.

The extent of the hearing for very deep and very high tones may, even with normal ears, have various boundaries.

You only have to remember the well known fact that there are people who, although they have a fine and good hearing, can never hear the chirping of the cricket. This is said to be one of the highest tones that we know; and some persons seem to be deaf to sounds above a certain tone.

In hearing, moreover, we are not alone concerned as to the intensity of the tone, and the number of vibrations in the second, but as to the speediness of the tones following each other, the space between, and a measure of the hearing, which shall answer all indications, must carry all these various points into view, in order to possess any practical value, and be also easy and convenient for use.

Try, gentlemen, if you, with the aid of a mechanic, at once educated in physics and music, are not able to construct such an instrument. The acoustic apparatus now to be found in the cabinets, for example, the *sirene*, do not answer our purpose, at least so far as I have been in the position to test them. Perhaps such an instrument can be constructed after the manner of a music-box, or hand organ; because in these there are a number of notes in a cylinder, of the same height of tone, which, by means of a simple contrivance, could be made to move with varied swiftness, placed with, and in various degrees of, strength of vibration.

As insufficient as the watch is, we have as yet no better measurer of hearing, only never forgetting that we must always examine as to the power of hearing conversation. When a repeating watch is not enough to show us if there is still hearing power, we can use a hand-bell, which may be rung behind the head of the patient.

It has been often recommended to use the vibrations of a tuning-fork, in order to ascertain the hearing power in cases still further advanced, such as when the tones of a watch cannot be distinctly heard, as well as for other diagnostic purposes; and we are said to draw direct conclusions, according as the vibrations of the tuning-fork can be heard or felt. I must confess, that with all my experience with this instrument, I cannot ascribe any diagnostic importance to the use of it; and I agree fully with *Rau*,* when he says: "The surgeon

* Page 37 of his Text-Book.

cannot control the subjective symptoms of a patient who easily believes that he hears a tone, when he only *feels* the continued vibrations through the skull bones." Very many persons are not in a condition, when the tuning-fork is placed on the bones of the head, to separate the conditions of hearing and feeling. This is true of even the most intelligent persons.

From deaf-mutes and others with whom it is impossible to come to a previous understanding as to what you wish to learn, you may expect still less from the use of this instrument, as an aid to diagnosis.

I have before alluded to what is called the conducting power of the bones of the head. We mean by this the capability of hearing a watch, or other tone-giving instrument, by placing it on one of the bones near the ear, when the auditory canal may be closed.

Now, since the idea was had, that this capability depended alone upon the bones, and that the remainder of the hearing-apparatus, auditory canal, membrana tympani, cavity of the tympanum, with its contents, were entirely shut out from any participation in this power, it was concluded that the hearing or not hearing of the watch laid upon the skull, depended upon the integrity or morbid condition of the auditory nerve, and its ramifications in the labyrinth.

The premises are not true, and therefore, all the conclusions are equally false. In the whole literature of this subject of conducting power of the bones of the skull, a misapprehension of what Johannes Müller has said, in speaking on this theme, lies at the basis; for this physiologist, with whose honored and great name, and acoustic experiments, such a misuse has been made in later times, especially by Erhard, who has already been spoken of to you as full of phantasies, speaks very plainly, and says, that we are not at all in a condition to decide how strong the conducting power of the bones of the head is, for we are not able to exclude the other parts of the auditory apparatus, in our experiments.

I would advise you always to note in every patient, not only to what distance he hears the watch, from the meatus, but also from the mastoid process, from the temporal and frontal bones, and this not only in the beginning, but during the course of the treatment.. We may be able thus to draw

valuable conclusions as to the diagnosis and prognosis. I will, however, not conceal from you, that as the result of my experience of years in exact observations of these symptoms, I do not expect much to arise from this conducting power of bone, either in the one direction or the other. However, in a science where so little exact is settled upon, we should never be weary of assembling new facts, and here rare and unexpected misproportions show themselves, which we may not be at all able to explain.

All that which *Erhard*, with such positiveness, has asserted on this subject, must be declared as purely fabulous.

Very often, deaf persons tell you of hearing better in the midst of noise and roaring sounds. Misapprehension, and lack of proper observation, are generally at the basis of these statements.

When a noise takes place about us, we unconsciously raise our voices, so that the patient, who is less disturbed by the noise than we, has the benefit of this elevation of voice for his less susceptible ear. Many patients say they hear much better when riding in the cars, and the explanation of it must be the one given above; moreover, the narrowness of the room, and the closeness of conversationists to each other.

(I have a very distinct recollection of travelling in the cars, at a time when I was quite deaf, and hearing very easily what was said by two gentlemen sitting several seats in front of me, while my neighbor could not hear one word of the conversation, he having healthy ears; but as soon as the cars stopped, and the noise ceased, I was unable to hear my friend in the same seat. It is not always the case that the deaf hear better in the midst of noise, as I have satisfied myself by frequent examination as to the point.)

Yet, there is a number of observations on this subject, which cannot be so summarily discussed. Thus, *Willis*, in 1680, tells of a man who could only converse with his deaf wife when a servant beat a drum. This symptom received the name *Paracusis Willisiana*. *Fielitz*, also,* speaks of a boy, the son of a shoemaker, who could only hear the words spoken in the room when he stood near his father, who pounded sole

* A. G. Richter's Chirurg. Bibliothek. B. ix, st. 3. s. 555.

leather on the lap-stone. When the father wished to speak to him, he took the hammer and pounded the leather. He also heard in the midst of the sound of a mill.

These are, however, rare instances, and we may ask ourselves, if similar symptoms may not arise when there is a partial breaking off of the connection between the ossicula auditus, in the cavity of the tympanum, for instance, a separation of the stapes from the incus. Heavy sounds would force the membrana tympani inward, and thus approximate a union in the severed connection of these two bones. If such a case occurs to you, it would be well to try the effect of the celebrated cotton wad to press upon the tympanum.

When we speak of a morbid acuteness, or fineness of hearing, we mean an abnormal sensitiveness of the ear to all sharp, shrill tones and loud noises. This is present in certain irritated conditions of the brain, in the various acute and chronic inflammatory affections of the deeper parts of the ear, and then, in a sudden change from hardness of hearing of a high grade, to normal hearing, as for example, from removing inspissated cerumen from the ear.

LECTURE XXV.

Noises in the Ear or, Tinnitus Aurium. — Examination of Patients.— Conclusion.

Gentlemen—We must, to-day, devote a little time to the irritated condition of the auditory nerve, manifesting itself by noises in the ear—Tinnitus aurium. The causes for this sensitive condition of the nerve, which does not depend on its irritation from external impression, may lie in the nervous parts of the ear, and exist in any of its morbid conditions; for we have seen that tinnitus aurium has been a symptom in the most of the diseases of the ear, which we have studied together. Every irritation, from any direction, working upon the acoustic nerve, will declare itself by its own peculiar symptoms.

We find these subjective tones, or noises, in all irritated, abnormal conditions of the brain, whether arising from the organ itself, or arising as a reflected sensation or irritation from any source whatever. We need not speak of the peculiar affections of the cerebrum, such as intoxication, anomalies of the materials of the blood, transient and permanent interferences with free circulation, with also that class of indefinable morbid symptoms, to which the vague names, relaxation of the nerves, excessive nervous irritation, nervousness, and the like, are attached.

Generally, these noises in the ear depend on abnormal conditions in that organ itself. We find tinnitus always present in acute inflammation of the membrana tympani, and of the cavity of the tympanum; and furthermore, it is present in coincidence with, or, as a result of all causes, which increase the pressure on the fluid of the labyrinth; if, for instance, the membrana tympani is pressed inwards by inspissated cerumen resting on its surface; or, if the Eustachian tube is obstructed so that the membrana tympani and the ossicula auditus lie

deeper inwards; or, if the stapes with its membrane, or the membrane of the fenestra rotunda, from any cause, be pressed against the labyrinth.

Every thickening and rigidity of the membranes of the fenestræ, if an increased tension be connected with it, may alone excite a very oppressive noise in the ears or head; and as chronic catarrh is the most common cause of deafness, so tinnitus aurium appears oftenest to result from the same cause. Chronic hyperæmia of the ear will often, also, produce this disturbing symptom; but we often see a considerable development of vessels on the membrana tympani without any complaint from noises in the ear. When ear patients, with good hearing, and negative symptoms in the ear, complain of noises in the ear, never omit to examine carefully the mucous membrane of the pharynx, because such irritative symptoms often arise from a morbid condition of this part.

Fleischmann, the Erlangen anatomist, relates a case where a man complained for years of a very annoying noise in the left ear, and in the post mortem section, a small grain of barley was found, which lay between the pharyngeal entrance of the tube and the bony part of the Eustachian trumpet.* More often the patients are not able to select one ear as the situation of the noise, but express themselves undecidedly, or say, that the noise is not so much in the ear as in the head.

(I have a case now under my observation where, in consequence of blows on the head, the membrana tympani was ruptured, and the continuity of the little bones severed, a high degree of deafness resulting, and very annoying tinnitus aurium; all the other active inflammatory symptoms having subsided. The other ear is in a normal condition, and all the noise is referred distinctly to one ear.)

Not to speak further of these subjective noises in the ear, which arise as symptoms of irritation of the auditory nerve, there are sounds comprehended under the name, noises in the ear, which have for their cause real sounds producing vibrations which are excited in the system itself. These are the sounds described as pulsating, intermittent sounds, which, for the greater part, are nothing more than the pulsations of arte-

* Linke's Sammlung. I. Heft., s. 183.

rial vessels, be they in the internal carotid which runs through the temporal bone in manifold meanderings, or in the smaller arteries. We may excite transient, but decided arterial pulsation in the ear, by sudden movements of the head.

Rayer * relates a case of pulsating sound in the head, synchronous with the pulsations of the heart, which was manifest on auscultation, and which immediately ceased on pressure of the mastoid branch of the posterior auricular artery.

No peculiar aneurismal widening of the vessels could be found, or any insufficiency of the valves of the heart, or morbid tone in the aorta or carotids, so that this noise must have had its origin in some especial peculiarity of the branches of the arteries behind the ear, or in some change in the parts over which they passed. *Rayer* advises auscultation in all noises in the ear, so that one may see if the physician, as well as patient, may not be able to detect the sound.

Since in many rodentia or gnawing animals, as for instance, the rat, mouse, squirrel, etc., the internal carotid passes through the side of the stapes ; so in man, according to Hyrtl,† there is always a capillary arterial branch between the side of the stapes through to the promontory, and exceptionally, there is a larger artery running through the stapes.

When the last-named state of things exists, it seems to me scarcely questionable, that intermittent noises in the ear depend on this communicated motion of the stapes, to which the patient may accustom himself, as the miller to the noise of his mill.

Certain blowing and whistling sounds occurring in chlorotic and anæmic patients may be referred to the vessels of the petrous portion of the temporal bone, and I call to your mind that the internal jugular vein, and with a constant enlargement, its bulbus, lies immediately under the floor of the cavity of the tympanum.

I do not know any special treatment of tinnitus aurium ; we must always attack the cause of the symptom. As we have said, very often these subjective symptoms are caused by abnor-

* Comptes rendus des Séances et Mémoires de la Societé de Biologie. Année 1854. P. 169.

† Vergleichend-anatom. Untersuchungen über das innere Gehörorgan des Menschen und der Saügethiere. Prag : 1854. S. 40.

mal pressure, which morbid conditions on the fenestra rotunda and ovalis have caused to be exerted on the fluid of the labyrinth. This explains why frequent air-baths, or douches, often effect so much, when given for chronic catarrh, for noises in the ear, even when no improvement in the hearing results. Sometimes the mingling of a few drops of chloroform to the vapor of warm water does good, and we can also employ chloroform and olive oil as a counter-irritant.

Now, gentlemen, in closing our meetings together I would urge upon you a diligent and careful recording of your cases. A comprehensive history of an observed case carried on through the treatment to discharge, or to an examination of the dead body, is the best means of making a young man an intelligent, carefully observing, sound reasoning physician.

Such an objective series of observations is of uncommon value, in that it always forces us to a constant reason or basis for our opinions, and bears in itself the necessity for severe self-criticism.

The more exact and objective are a physician's histories of cases, the more is he in a condition to advance the interests of science, and to assist suffering humanity. The less he does this, and the quicker he is to draw his final conclusions and diagnosis, the quicker and more certainly he falls into the beaten track of a mechanic, and so common and convenient self-complacency of many old practitioners to an unscientific and purely symptomatic estimation of disease.

It is not necessary to tell you how indispensable, full and careful histories are for observations, which may extend through years, and for the explanation of post-mortem appearances. Nowhere is a thorough and purely objective observation of cases more necessary than in a branch of medical science, such as aural surgery, which is so incomplete, and we may say one which until lately has been very carelessly investigated.

Every honest logical observer is here a gain for science, because he collects new facts, which may serve as proofs for those already furnished, and render our knowledge more and more complete. It is not enough to make a few scanty notes, and at the close the preconceived diagnosis, but you must give all the details that the nature of the case demands, strictly following it with no external prejudice. This is generally best at-

tained by a certain prepared general plan, perhaps such as I now give you:

Name, age, profession or occupation, residence, origin and course of the disease. (Observe if accompanied by pain, noises in the ear, if any exciting cause existed, and of what nature. If deafness resulted immediately, or some time later, when the present condition of the hearing commenced, if this be constant or variable, what other symptoms of disease were present.)

Present condition, subjective. Hearing distance with watch and voice, conducting power of bones of the head, patient's own voice clear or muffled, worse in morning or evening?

Is voice or conversation of patient peculiar?

When and under what circumstances do deafness and noises in the head increase?

Objective.—State of external canal, or meatus, cerumen, membrana tympani, brilliancy, light-point, color, handle of the malleus. Membrane of the pharynx, catheterization and air-bath or douche. Changes in hearing distance occurring after this, or on membrana tympani. General condition, headache, vertigo, hereditary predisposition.

Treatment previously pursued.

Treatment.—Diagnosis.—You see, how many things are to be noticed in our first examination of a patient, and that it will occupy much time. You must never allow the opinion or judgment of the patient to overcome your own. He is apt to underrate important facts. You ask the questions, and the patient has only to answer, but you will be often obliged to remind the patient of your question. It is incredible how much labor it sometimes costs to get a direct answer to a question, and especially as to the beginning of a complaint. A patient who has been hard of hearing for years, after he has excused himself many times, will tell you, that he has been deaf for six weeks. After the patient has stated when his complaint began, ask, if before that time he had perfectly good hearing in both ears, and you will be surprised to find how far back the period will be pushed. You will find similar inconsistencies in other patients, so that you must never come too quickly to decisions.

Gentlemen—In the beginning of our study together we

could find no good reason, why so few physicians interest themselves in the cure of the diseases of the ear, and why the interest in this field of our science was so little.

Now, perhaps, you may inquire, if it be not that the examination and treatment take so much care and time.

Diseases of the ear, in consequence of their slow, and often painless course, come very late to the attention of the physician, at a time when very little can be expected for a rapid and certain cure. This is undoubtedly now true, but you must remember, that quite another condition of things will occur so soon as the public learns that with ear-diseases as well as other complaints much may be easily done in the beginning, but that the older the case, the more unfavorable the prognosis, and as soon as it is learned that physicians may be found who will undertake their treatment. As to the trouble and painstaking required, it is not to be denied that a physician of the present time, who labors not only for practice, but also for science, must have a wonderful amount of patience, endurance, and perseverance, and it may be owing to this fact that surgeons, who as young men commence the aural practice with great zeal, as rarely continue in it. However, in Germany especially, it will be a long time before convenience takes the precedence of duty and right, and such reasons for abandoning, or not taking up the practice, can never be general. Furthermore, we will not forget that the beginning of everything is hard, and that the study of aural surgery is still in its infancy, and as it progresses, its scientific and practical study will be easier and simpler, and thus, gentlemen, we come back to that which we observed in our first coming together. The lack of interest in aural surgery is a wrong state of things founded on ignorance and prejudice.

May it have been my fortune, in the course of our mutual studies, to have fully proved the incorrectness of the general acceptation, and I would that I may have excited such a peculiar interest in this part of medical science, that you will always willingly and with success undertake the treatment of the deaf, and may I have caused some of you to labor specially and only in this department.

INDEX.